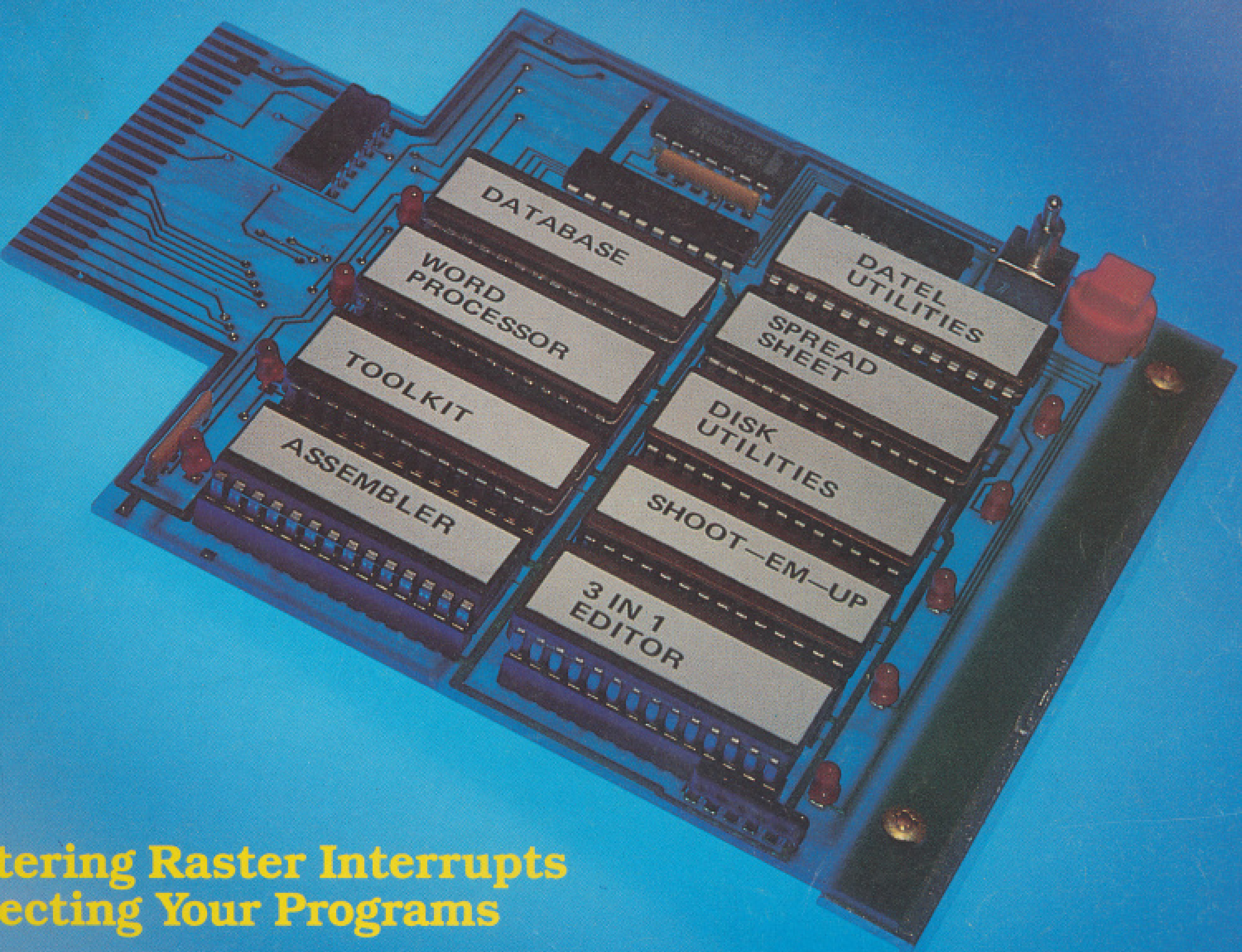
YOUR

# COMMODORE

DECEMBER 1988

£1.30

## A Bit on the Side
## Datel's ROM Expander




**Mastering Raster Interrupts**
**Protecting Your Programs**

**Games Reviewed:**
Red Storm Rising
Battle Island
Foxx Fights Back
Pool of Radiance

UNBEATABLE PROGRAMS:
Sprite Controller △ Function Key Labeller
Directory Editor △ Double Height Characters



Programmer Profile
Ratt & Bish
Image Works






# Quite simply, it leaves other word processors lost for words.

WordPerfect 4.1 for the Amiga includes many features not found in other word processors.

Newspaper style columns can be displayed on screen, 110,000 word UK phonetic dictionary, word-count, background printing and automatic reformatting increase efficiency.

Line drawing and rulers, search/replace and 5-function maths are invaluable assets.

By using the Amiga's pulldown menus nearly all WordPerfect's features are available at the click of a mouse. This makes learning easier than ever before and using it a real pleasure. But if you prefer the traditional function keys there is a colour coded template to make life easy.

What you see on the screen is what will actually print. This makes good, professional layouts simple.

Documents are treated as a whole and not a series of pages. Reformatting and repagination after editing are automatic and very rapid.

However fast you type, you will never be too fast for WordPerfect.

To find out more, write to the address opposite.

And see how WordPerfect delivers today what others are still searching for.

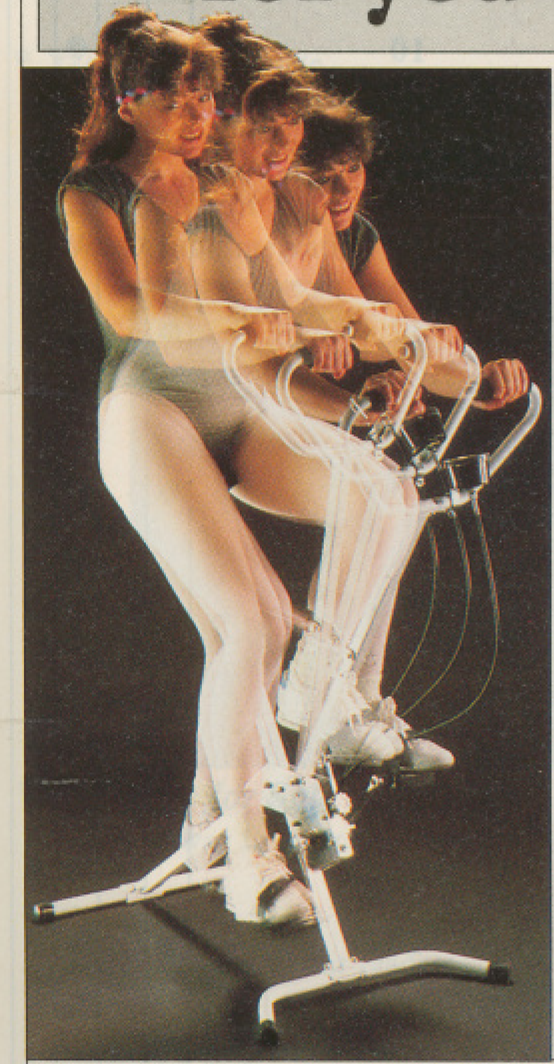



SENTINEL
SOFTWARE

Wellington House, New Zealand Avenue, Walton on Thames, Surrey KT12 1PY.
Telephone: (0932) 231164
Telex: 916005. FERGUS G.

WordPerfect DataPerfect PlanPerfect Library Executive

# Two great offers, specially selected for you by Argus and Grattan



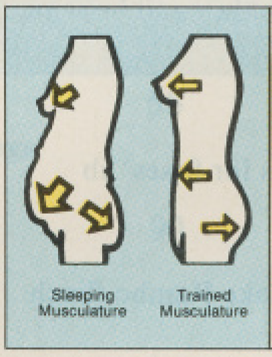
*As the reader of an Argus Specialist Publications we think you'll appreciate really great value. So we've got together with Grattan to bring you these superb offers.*

## Exercise Cycle/Rower £34.99

Now you can fight the flab and keep in great shape in the comfort of your own home with this versatile exercise cycle/rower.

It takes just a few minutes a day to stay fit because this highly efficient firming, toning and fitness machine combines two essential forms of exercise.

The pump action handlebars provide aerobic action for the chest, heart and lungs whilst the cycle will soon tone up your stomach, thighs and buttocks.






This machine includes special features normally only found on more expensive models, including a combined speed and distance meter to monitor progress and adjustable tension for more strenuous exercise the fitter you become.

And when you've finished exercising the machine folds quickly away for easy storage.

*So shape up and send for your cycle/rower today.*

## Turbo Power Wash £18.99



Forget about trips to the car wash or slopping water about in buckets, here's the fast, effective, modern way to wash your car.

The Turbo Power Wash is durable and lightweight and turns any standard British hosepipe into a high power spray which blasts away dirt and gets to those hard to reach spots on your car or caravan.

*But its versatility doesn't end there.*

You can use the Turbo Power Wash clean patios, paths or even dustbins.

The specially developed action uses mains water pressure only to produce a self-contained power wash system with three different spray pattern tips, an 8oz soap reservoir, fingertip controls and a soap/washer ratio control.

For an amazing £18.99 the Turbo Power Wash comes complete with a free 32 fl.ozs of cold water suds concentrate.

**Telephone orders direct on 0274 521126**

Credit card holders please phone your order quoting ref: **U0022**

Send to:– Grattan Response, ("Argus Offer"), Admail 79, Leeds LS1 1XE.

### Exclusive Offer
### HOW TO ORDER

| EXERCISE CYCLE ROWER | | | |
|---|---|---|---|
| CODE | PRICE | QTY | TOTAL VALUE OF ORDER |
| 91K352HB3 | £34.99 | | |
| **TURBO POWER WASH** | | | |
| CODE | PRICE | QTY | TOTAL VALUE OF ORDER |
| 72K662HB3 | £18.99 | | |
| | | p&p | £1.50 |
| | | GRAND TOTAL | |

I enclose cheque/postal order payable to GRATTAN RESPONSE ("Argus Offer") or please debit my Credit Card

ACCESS ☐ VISA ☐ **U0022**

Card No: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Expiry Date: Month ________ Year ________

Signature ________ Date ________

Name ________

Address ________

________

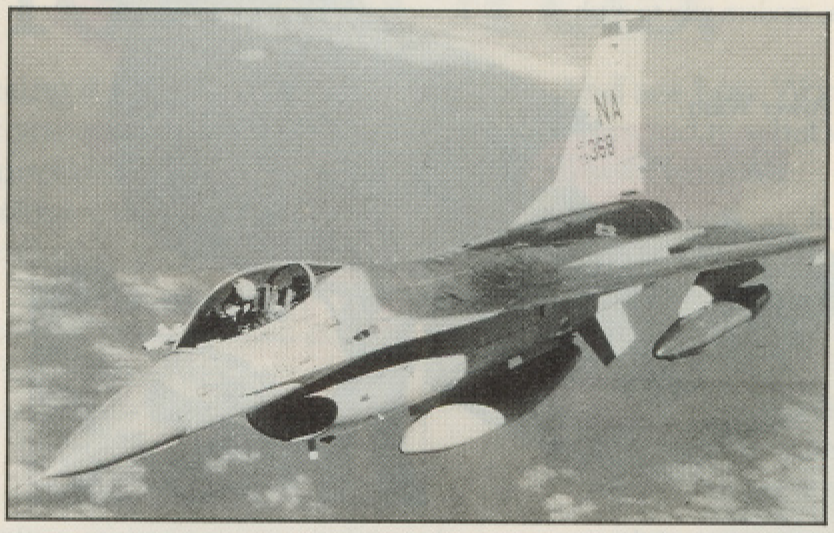
Postcode ________

Grattan plc, Anchor House, Ingleby Road, Bradford BD99 2XG. Reg No. 249001 England. Delivery subject to availability.




## FEATURES





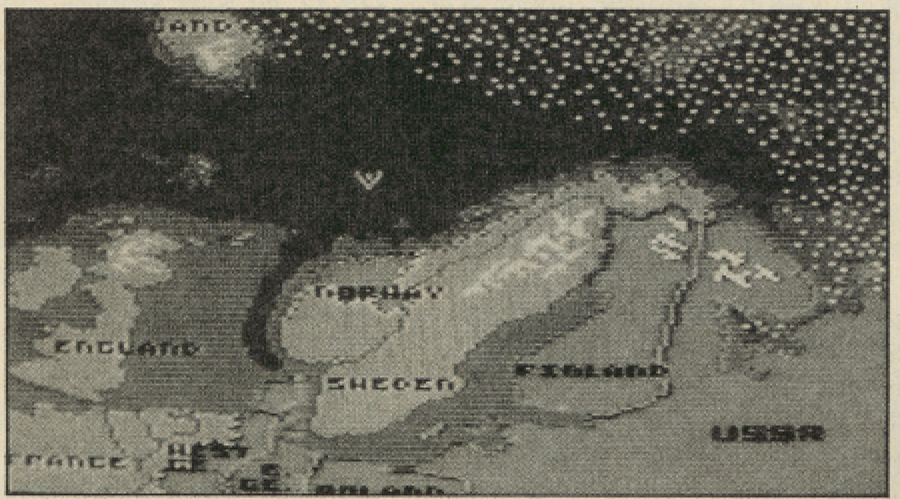

Editor:
*Stuart Cooke*
Deputy Editor:
*Eric Doyle*
Technical Editor:
*Paul Eves*
Advertisement Manager:
*Paul Kavanagh*
Advertisement Copy Control:
*Andrew Selwood*
Artist:
*Alan Batchelor*
Designer:
*Neil Sweetman*
Origination:
*Ebony Typesetting*
Printers:
*Chase Web*

Your Commodore incorporating Your 64 is a monthly magazine appearing on the first Friday of each month. Argus Specialist Publications Limited Editorial & Advertisement Office, Your Commodore, No 1 Golden Square, London W1R 3AB. Telephone: 01-437 0626 Telex: 8811896.
Subscription rates upon application to Your Commodore Subscriptions Department, Infonet Ltd, 5 River Park Estate, Berkhamsted, Herts, HP4 1HL. U.S.A. Subscription Agent: Wise Owl Worldwide Publications, 4314 West 238th Street, Torrance CA 90505 U.S.A.

ABC
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

## REGULARS








## LISTINGS




**VOLUME 5**
**NUMBER 3**

ARGUS PRESS GROUP

**JAN ISSUE AVAILABLE 2nd DECEMBER 1988**





**ISSN 0269-8277**

# DATA STATEMENTS

## Pac-Man Bounces Back

As a follow up to Pac-Land, GrandSlam are now poised for a burst of Pac-Mania.

In his new adventures, Pac-Man is back in the maze world but this time it's a 3D scene and the popular title hero can bounce out of trouble. The ghosts are still haunting the maze but Blinky, Pinky, Inky and Clyde have recruited two new characters, Sue and Jumpy, to help drive Pac-Man dotty.

Pac-Mania attracted a lot of attention at the recent PC Show and will be available for the Amiga (£19.95) and C64 (£9.95 cassette and £14.95 disk).

***Touchline:***
***GrandSlam Entertainments,*** *12-18 Paul Street, London EC2A 4JS.* ***Tel:*** *01-247 5413*

## Active Try Kipling

Active Distribution, whose *Hardball* showed the Americans how baseball should be programmed, have now signed a deal which gives them the marketing and distribution rights to Coktel Vision's software range. The French company currently hold two important licences for Walt Disney products and Active's Managing Director, Richard Stallibrass, was delighted to successfully negotiate and close the deal in the competitive atmosphere of the PC Show.

The two licences are for Kipling's *The Jungle Book* and Barrie's *Peter Pan*, two of Disney's largest grossing cartoon feature films. Future titles will also include Freedom, Terrific and Emanuelle.

Stallibrass's company has also been actively signing up the German software house EAS whose *Zero Gravity* is currently receiving rave reviews in their home country. Zero Gravity is a cross between tennis and pinball in space and will cost £9.95 and £14.95 on C64 cassette and disk or £19.95 on the Amiga.

Also from EAS, we will be hearing and seeing Ultimate Soundtracker, a music utility with a choice of 127 instruments. The program is designed for both amateur and professional programmers who wish to add music to their programs without taking up too much memory.

***Touchline:***
***Active Distribution,*** *Greyhound House, 16 Greyhound Road, Hammersmith, London W6 8NX.* ***Tel:*** *01-381 2757.*

## Braybrook's Back

Andrew Braybrook, Hewson defector and author of Paradroid, Uridium and Morpheus, has produced *Intensity* for British Telecom's Firebird label. The game involves rescuing colonists from the beleaguered Canis Major space station, orbiting Sirius.

The gameplay sounds like a development of the old standard *Defender* arcade game, as you have to rescue the colonists before they are captured by invading aliens and mutated into living bombs that will explode when you try to pick them up in your drone ship or skimmer.

Available for the C64, the game costs £9.95 on cassette and £12.95 on disk.

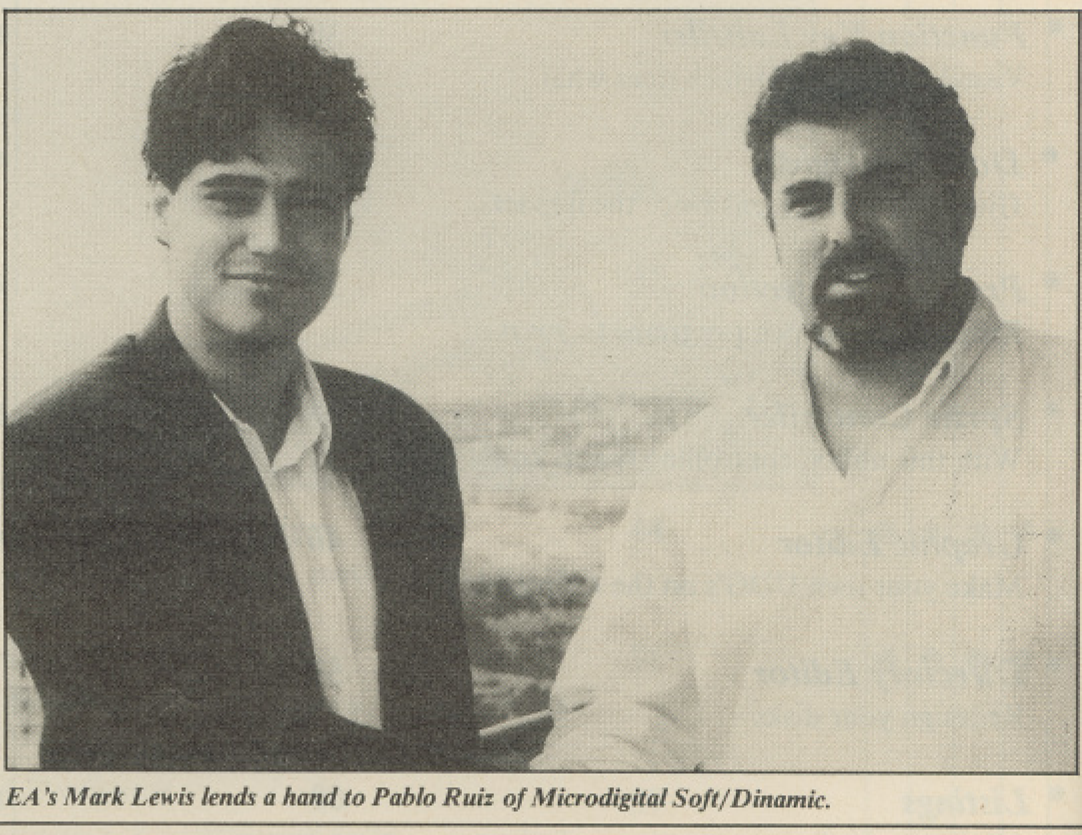
***Touchline:***
***Firebird Software,*** *74 New Oxford Street, London WC1A 1PS.* ***Tel:*** *01-673 5373.*

## European Arts

Electronic Arts has been busy signing up the best of mainland Europe's software houses. Spain's Dinamic and France's Ubi Soft have both recently signed distribution deals with the British branch of the American company.

Electronic Arts will be responsible for the European marketing of Dinamic's products except for Spain, Portugal and Italy. The Ubi Soft contract is a reciprocal agreement to handle the sales of the company's products in the UK and Eire in the same way as Ubi Soft have been handling EA's output to Europe.

Dinamic has already had success in the UK charts with *Game Over* and *Army Moves*, previously released through Imagine Software. On behalf of Electronic Arts, its Director of European Publishing, Mark Lewis



***EA's Mark Lewis lends a hand to Pablo Ruiz of Microdigital Soft/Dinamic.***

## Munster Release

The budget software houses seem to be racing to branch out into the full-price market. The latest contender for the big ackers brigade is Alternative, whose sister label Again Again bursts onto the scene with a major license to produce the computer game based on *The Munsters* TV series, which has recently been successfully pulled out of mothballs by Channel 4.

The programming team responsible for the game is Teque, an offshoot of Gremlin Graphics, currently enjoying independent success with titles such as Terramex and Pac-Mania.

The TV series features an average American family of assorted monsters who think that they are normal and the rest of the world is ugly and weird. Head of the family is Herman Munster, a Frankenstein clone, who is both clumsy and befuddled. His wife, Lily, is the daughter of a vampire, Granpa, who spends most of his life in the basement laboratory mixing up trouble for Herman. With parents like Herman and Lily, it's no wonder that their son, Eddie, is a crazy, mixed-up werewolf. The final member of the family is Marilyn, an orphaned cousin, considered hideously ugly by the rest of the family.

The game, scheduled for release in mid-November, is available for the C64 (£9.99) and the Amiga (£24.99).



***The Munster clan***

This month's award for strangulated prose goes to the author of the Munsters' press release. Sort this one out. "Q: What do you get when you combine the freshness of a new full-priced software label, but which is the sister company to the UK's most successful software house this summer (according to gallup) with one of the most popular TV programmes amongst computer games players at present, with one of the leading programming teams in the country?" How about, "A: Confused!"

***Touchline:***
***Again Again,*** *Units 3-6 Baileygate Industrial Estate, Pontefract, West Yorkshire WF8 2LN.* ***Tel:*** *(0977) 797777.*

---

said, "Naturally we are delighted to have signed Dinamic as one of our affiliated labels. We were attracted to the professionalism Dinamic has shown both in the quality of its products and by the high standard of its marketing."

Of the Ubi Soft deal, Lewis goes on to say, "Ubi Soft's products are of a high quality and perfectly suited to the UK market. We are looking forward to working towards chart success with Ubi Soft's titles."

The first release from the new signings will be *Game Over II* from Dinamic and Ubi Soft's *Iron Lord, Skateball* and *Puffy's Saga.*

***Touchline:***
***Electronic Arts,*** *11-49 Station Road, Langley, Berkshire SL3 8YN.* ***Tel:*** *(0753) 49442.*



***Konix director, Sandra Holloway, practices levitation on the new Predator.***

## Konix Sticks Out

Two new joysticks have been launched by Konix ready for the Christmas market. As desktop units, the *Predator* and *Megablaster* are a departure from the hand-held Speed King design which has placed Konix firmly at the forefront of the joystick market.

The Megablaster is a smaller, budget version of the Predator. The Megablaster (around £8) has bubble switches and a gearstick style handle but the Predator (around £13) features microswitch operation with a moulded handgrip handle.

The new sticks are intended as a complementary line alongside the Speed King range rather than as a replacement for them.

***Touchline:***
***Konix Products,*** *Unit 35, Rassau Industrial Estate, Ebbw Vale, Gwent, Wales NP3 5SD.* ***Tel:*** *(0495) 350101.*

## Trilogic Open Up

Trilogic have extended beyond their mail order services to include a new computer showroom at their Bradford premises. On sale in the Trilogic Shop is the full range of Trilogic Commodore utility software and hardware, plus C64 computers, 1541C disk drives, Amiga 500 and 2000 machines. For the Amigas, there are also MS-DOS bridge boards, external floppy and hard drives, laser printers and a host of other add-ons.

The company also has a range of Commodore PCs at 'very competitive' prices and can supply all of the leads and connectors for the full range of products.

Trilogic's shop is open from 8.00am to 6.00pm Monday to Wednesday, from 8 till 8 on Thursdays and Fridays, and from 8 till 5 on Saturdays.

***Touchline:***
***Trilogic, Unit 1, 253 New Works Road, Bradford BD12 0QP. Tel: (0274) 691115.***

## Daley Doesn't

When Daley Thompson lends his name to a project such as Ocean's Olympic Challenge game, he likes to get involved in the action. On a recent visit to check up on the progress of the game, before leaving for his ill-starred visit to Seoul, Thompson was so impressed with the advancement in graphics quality since *Daley's Decathlon* that he wanted to know all about the system used to create the realistic graphics.

The Ocean team have been liaising closely with Thompson so that the scoring system is as accurate as possible and his points book has been on loan to Ocean for reference purposes.

Unfortunately, the Decathlon star failed to fulfill a nation's hopes by only achieving a disappointing fourth place in the Olympics, despite an encouraging and impressive performance in the 100 metres event. Perhaps a workout in the Ocean game's gym would have helped to improve his performance.

For our view of *Daley Thompson's Olympic Challenge,* see our review in this issue.

***Touchline:** Ocean Software, 6 Central Street, Manchester M2 5NS. **Tel:** 061-832 6633.*



*Telecomsoft's stand gets the finishing touches from 'Goldie'*

## PC Show

As computer shows go, the PC Show was a great amusement arcade with more promises than realities. In other words, the major companies went for the ultimate hype of providing the arcade machines and leaving the visitors' imaginations to run riot over the excellence of the forthcoming computer versions. Hype, hype, hype!

There was so little finished software available that I swore I'd refer to the show as exhibiting SOTWARE because there was no f in software. The three top-tips for the Christmas number one slot were Thunder Blade from US Gold, Afterburner from Activision and Ocean's Operation Wolf, but very little evidence of the software versions was available. Time will tell.

The game which got everyone buzzing probably won't make the top ten because, at the moment, it's only available for the ST. It's name is Weird Dreams and it is surreal madness from British Telecom. The gameplay is pretty understated but the concept is so totally OTT that it has to be an ST hit and I hope we'll see an enhanced Amiga version soon.

This year's show was held at the new Earls Court venue and most people I talked to seemed to be of the opinion that the atmosphere at the old venue, Olympia, was preferable. The frantic atmosphere of the Leisure Hall and the hallowed atmosphere of the Business Hall were separated by the Central Hall, which seemed to be a mishmash of hardware and computer manufacturers, software houses, publishing houses and business software manufacturers. There was a special section for Taiwanese companies but with very few takeaways in sight.

Commodore's stand stood like a large, black mausoleum in the middle of the Central Hall. Its fortified exterior looked foreboding and uninviting compared to the Atari stand, which I found that I'd walked through without even noticing!

Elitism was the watchword, with US Gold building an impenetrable and unavoidable citadel beside a more open display area. Mirrorsoft had an impressive spaceship stand which would have stolen the show had the organisers layed on a suitable power supply for their dry-ice, mist machine!

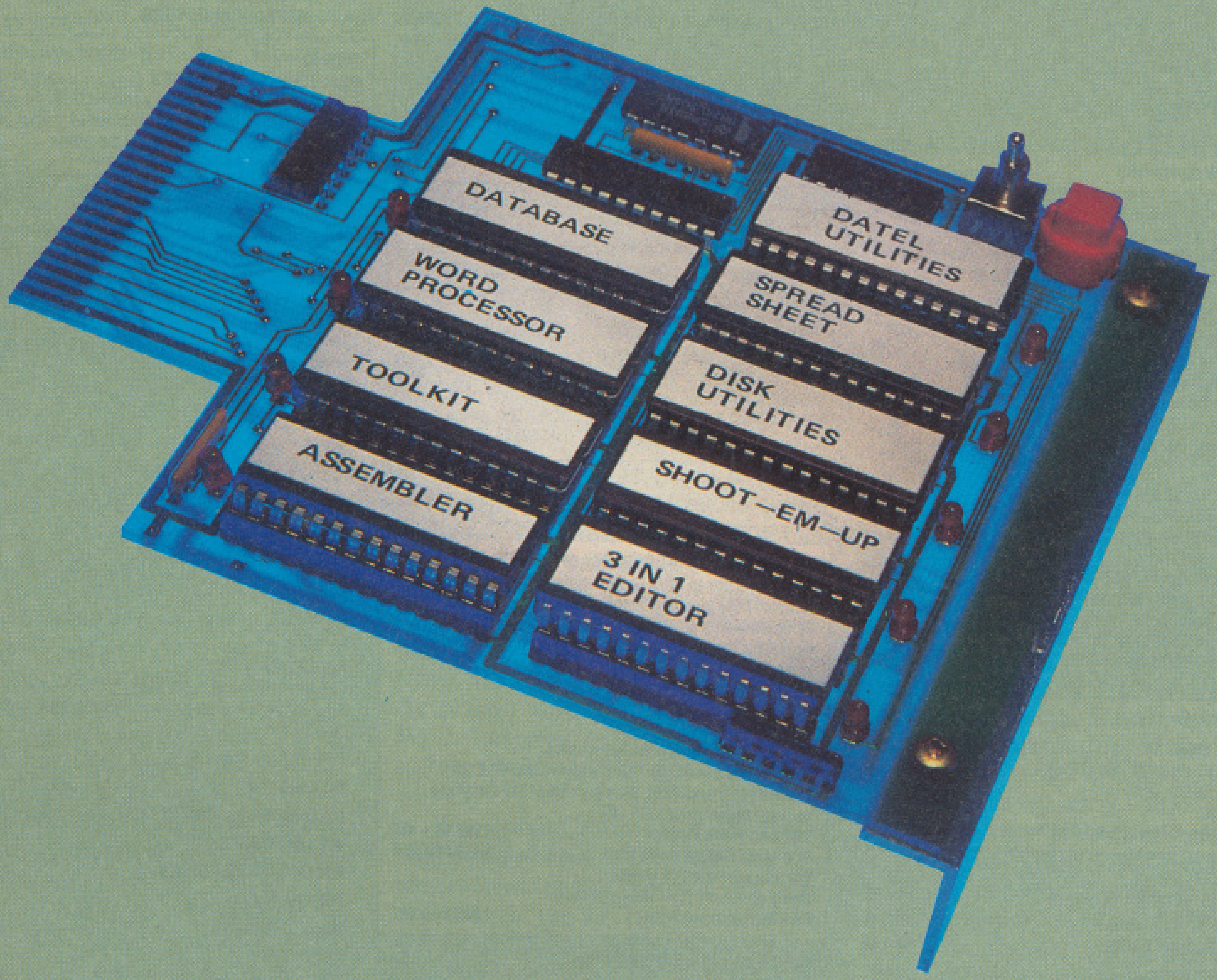
Electronic Arts and Mediagenic (Activision) went to the lengths of avoiding the public by hiring hotel suites and ferrying journalists and lesser notables to their private venues by limousine. On the first day there were nasty scenes as chauffeurs vied for parking spaces, holding up the traffic and their fists in their eagerness to please their employers. For my part, I struck a blow for anti-elitism by arriving at EA in a taxi and plunged to travelling in a mini-bus to Mediagenic's venue.

Overall the 1988 PC Show left the body satiated in food and alcohol but the spirit thirsting for more tangible Christmas fare.

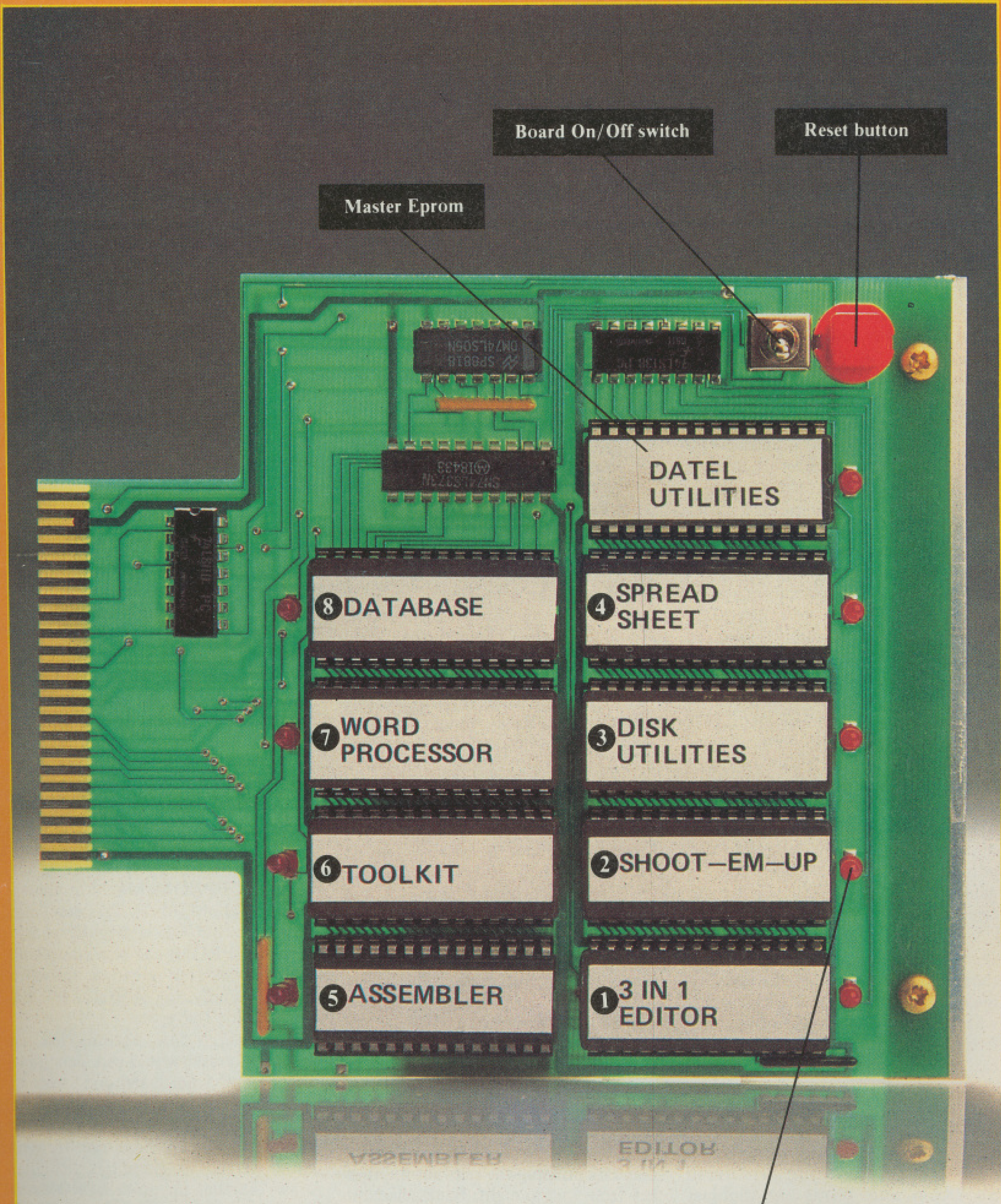
*Broaden your mind with Datel's SuperRom Expander*

***By Kerry Fowler***

# A BIT ON




# THE SIDE




How often do you think about what actually happens when you plug in a cartridge? Probably never, because this is one of the least documented but potentially most useful facilities which the C64 and C128 offers.

The main benefit of a ROM pack is that a program loads instantly and the main applications these days are for backup (nudge, nudge) cartridges and the occasional game cartridge. This belies the true potential of ROM expansion and the area of do-it-

yourself expanders has only really been explored by Datel's range of cartridge constructors and the SuperRom Expander Board.

The SuperRom system is amazing because up to 256K of extra programs can be recalled almost instantly via the cartridge port. The programs are stored on eight EPROMs supported by Datel's own indexing and programming chip. The EPROMs may be 8K, 16K or 32K capacity or any mixture of these types.

The only problem with this lies, not in the expander, but in the operating system of the C64. Cartridges are expected to occupy the $8000 to $9FFF region of memory and this 8K capacity means that the larger EPROMs have to be banked in two or four 8K chunks. To compensate for this the Datel on-board operating system has a banking facility.

## Making the ROM

To create a suitable EPROM for the board, there are two programs in the SuperRom on-board operating system but an EPROM blower is necessary to transfer the resultant disk-saved programs onto a chip. Eminently suitable and convenient is the Datel EPROM programmer, Eprommer 64 (£39.99), though any suitably interfaced EPROM blower would do.

The on-board EPROM generator is called up from the SuperRom menu by pressing the F5 key. This displays a secondary menu which allows directory display, the sending of DOS commands and the two program generators; one for machine code and one for Basic routines.

The Basic generator loads a specified file from disk and then allows the user to specify a load address. This means that relocated Basic programs, which leave the lower part of memory free for redesigned characters or code, can be reloaded at the correct address. For normal Basic programs a simple press of the RETURN key is all that is necessary.

The generator next formats the program for booting up from SuperRom and prints up the last memory location that was accessed. The top right corner of the screen is used to display the minimum EPROM value that will accommodate the program.

The screen then displays the three EPROM types ready for the user to specify which type of EPROM will be used. This is an important decision because an 8K formatted program can be stored on any EPROM but the banking systems differ on each type. Fortunately, the generator will not allow the accidental selection of a smaller capacity EPROM than the minimum required.

Before being asked for a filename for the formatted file to be saved under, another decision has to be made. The SuperRom sits in memory at location $8000 to $9FFF. This means that the EPROM replaces this section of memory so that any program which coincides with any, or all, of these locations will not run unless the SupeRom is switched out. For Basic, this is rarely necessary.

Once the program is saved, it may be transferred to ROM and then plugged into the board ready for use.

Using the machine code formatter follows roughly similar lines. The program is loaded from disk, the start address entered and then an extra selection panel appears.

The first option asks if a RAM/ROM is to be generated. This is to allow the system to create files suitable for replacing the C64 operating system with a chip of your own. Even if you merely change the power-up message to display your name, this can be quite an interesting facility though not really applicable for use on the SuperRom board.

If the final EPROM is for inclusion on the board, the answer to both of the questions posed is 'no' and the memory shaping questions can be tackled. When these have been answered the program generator will input the value that you've given for location $01 and the SYS location. After this the process again follows the same steps outlined above for EPROM size selection, saving to disk and EPROM generation.

With both chips on the board, the start-up menu of the SupeRom operating system will change to display the names given to the two EPROM programs.

Selection of one of the programs is made by pressing the relevant number key from one to eight. Bank selection can be made with the F1 key, the EPROM generator returns by pressing F5 and the SupeRom can be switched out in favour of normal Basic mode by pressing F3. F7 displays a full EPROM directory which gives more information: the socket number on the board, EPROM type, the program name and type, location $01 value, and the program SYS address for code routines or RUN for Basic programs.

| *Value in $DE00* | | | | |
|---|---|---|---|---|
| **EPROM type** | **$38** | **$28** | **$18** | **$08** |
| **2764 ( 8K)** | 1 | (1) | – | – |
| **27128 (16K)** | 2 | 1 | – | – |
| **27256 (32K)** | 4 | 3 | 2 | 1 |

***EPROM bank selection system***

Normal, autostart EPROMs which operate just like cartridges can be fitted to the board. Full instructions for creating these EPROMs are given in the manual, including a sample autostart routine.

## The SuperRom Experience

Using the board caused a few initial problems but these were ironed out by delving into the informative, if at times confusing, manual. The small booklet tends to be a little difficult to read if you don't understand how the cartridge system works. At first, I was a bit too ambitious and found that the best practise was to start with small, simple routines before building up to the longer, more complex program transfers.

Seasoned programmers should be able to get even more from the board because the potential for internal programming of a master chip to control the board is there for those who wish to investigate further.

An initial experiment with the board can be expensive because the SupeRom board costs £29.99, Eprommer 64 raises this to £69.98 and eight 32K EPROMs would produce a grand total of £105.98. This may seem expensive but it's a one-off charge because EPROMs can be removed and added to suit your purposes, and extra EPROMs only cost £4.50 each for 32K or £3.00 for 16K types.

An extra few pounds for an EPROM eraser would also be a good investment. Since Datel don't seem to provide one, you could try your local electronics supplier. Mail order suppliers, Maplin, have one in their catalogue for £49.95 but this particular eraser handles up to 40 EPROMs at one time.

***Touchline:***
***Product:*** *256K SupeRom Board.* ***Supplier:*** *Datel Electronics, Units 8/9, Dewsbury Road, Fenton Industrial Estate, Fenton, Stoke-on-Trent.* ***Tel:*** *(0782) 273815.* ***Machine:*** *C64/128 with disk drive.* ***Price:*** *£29.99.*

# F.S.S.L

FINANCIAL · SYSTEMS · SOFTWARE · LIMITED

## BASIC 8

Unleash the hidden graphics power of your 128. At last, your Commodore 128 can rival the 16 bit micros! Imagine your 128 in 80 columns producing a resolution of 640 x 200 in mono and 640 x 192 in 16 colours without any additional hardware! Sounds impossible? Not with Basic 8, the new graphics language extension.

Basic 8 adds over 50 Hi-Res graphic commands to C128 Basic. Just select one of the many graphics modes and draw 3-D lines, boxes, circles and a multitude of solid shapes with a single command. We've even added commands for windows, fonts, patterns and brushes.

To demonstrate the power and versatility of this graphics language, we have created Basic Paint, a flexible icon-based drawing application program. Basic Calc, a full featured spreadsheet and Basic Write a simple to use word processor with a multitude of fonts. Also included is an icon based desk-top utility which provides quick and convenient access to each of your own Basic 8 creations.

All this graphics potential is yours for **£34.95**, 64k Video RAM upgrade kit **£19.95** and The Beginners Guide to Basic 8 with disk **£19.95**.

## Basic 8 Tricks & Tips Volume 1

NEW

This book and disk package explains with the help of demonstrations the necessary routines to display five different screen resolutions: 640 x 400, 640 x 480, 720 x 480 and 752 x 600. This means that you can equal the display power of both the Atari and Amiga 500. As a bonus we have included a program to demonstrate how to use a total of 128 colours within Basic 8. Book and disk. **Only £4.65.**

## 1541/71 Disk Drive Alignment Package

Problems with your disk drive? The alignment package reports the alignment condition of the disk drive as you perform adjustments. On screen help is available while the program is running. Includes features for seed and head stop adjustment. Allows you to test each full and half track as you realign the drive. Complete instruction manual on aligning both 1571 and 1541 drives. Even includes instructions on how to load the alignment program when nothing else will load. Works on the C64, SX64 and 128 in 64 or 128 mode. **Only £24.95.**

## 1571 FIX ROM

Are you experiencing any of these problems with your 1571 disk drive, Errors when using Superbase? Device Not Present Errors? Major problems when 2 or more open files? Takes forever to recognize a floppy disk? If you have one or more of these problems then you need 1571 FIX ROM, developed by Commodore Inc USA, just plugs in, solves over 19 main problems. **Only £24.95.**

## Commodore 1581 Disk Drive

The New Commodore 1581 disk drive is now available for the C128 or C64. This drive offers one megabyte of memory, THREE THOUSAND ONE HUNDRED AND SIXTY blocks free, (800K formatted capacity), and a very fast EIGHT THOUSAND Characters per second loading rate. Software for this new drive includes, VizaWrite Classic, HackPack, Petspeed, Oxford Pascal, CAD PAK, Chart Pack, Fontmaster, Spellmaster and much more. Using a package called Super 81 Utilities most software can simply be copied across to the new format. The drive is available for – **£184.95.**

## Warp Speed

An incredible accelerator cartridge for the Commodore 128 and 64. Warpspeed has a switch that allows you to select 128 or 64 mode. The features of this cartridge apply to 1541, 1570, 1571 and 1581 disk drives in 64 or 128 mode. These features include loading, saving, formatting and verifying 10 times faster, extended DOS commands, print screen, disk and file copy, built in machine monitor, built in track and sector editor and much more.
**Only £34.95.**

## The Big Blue Reader

New from SOGWAP Software Inc., The Big Blue Reader is ideal for those who use IBM PC compatible computers at work and have the Commodore 128 or 64 at home. The Big Blue Reader is not an MS-DOS emulator, but rather a unique and easy way to transfer word processing, text and ASCII files between two totally different formats, Commodore and MS-DOS. The Big Blue Reader requires a 1571 on both the Commodore 128 and 64 and will not work with a 1541 or similar drive. **Only £44.95.**
**(Upgrades £7.50)**

## Twin Cities 128

NEW

This is not just another book, it is the new Bible for all 128 users. It contains hardware and software reviews, rumours, opinions and mayhem about the 128 over the last two years; software tricks for most common packages; exploring and programming the 128 and machine language programming. Other topics covered include CP/M, all add-ons including the 1581, 1571 and 1750 RAM units, choosing software, Basic 8, expanding your 128, GEOS, graphics and sound. This book was written by the well known Commodore names, Jim Butterfield, Todd Madson, Fred Bowan and Loren Lovhauq. **Only £12.95.**

## The Programmers Notebook

NEW

The Programmers Notebook is a high speed data storage and retrieval system designed specially for the programmer. With Programmers Notebook you can develop a special programming information database tailored to your own needs. It will provide a means of indexing your short routines and other programming information. Each entry has a brief description, date and type of routine. Once entered you can conduct tailored searches on the entire database, in fractions of seconds, looking for any information you select. It will sort, compile, display and provide printed copies in almost any format you desire. **Only £24.95.**

## Home Designer 128

NEW

Forget the name this is not a kitchen planner, it is probably the most advanced CAD system for the C128 computer. Home Designer allows you to create extremely detailed and accurate drawings at virtually any scale, with any resolution approaching a plotter. It offers accurate scaling, a powerful command set and up to five drawing layers. Why is Home Designer better than the rest? It is the only CAD system which allows layers of diagrams to be drawn and then laid upon each other in any order. Home Designer has an advanced zooming feature, allowing you to actually increase the drawing resolution, unlike other programs which simply display fat dots on the screen. Most dot matrix printers and plotters are supported and Home Designer works with a Commodore 1351 mouse.
**Only £34.95.**

## Super Pack 2

NEW

Super Pack 2 is the combination of three packages, Pocket Writer, Filer and Planner. The integrated word processor, spreadsheet and database work on the Commodore 64 or 128 in 40 or 80 columns. Each package has all the features you would expect, plus a few you would not. The word processor displays on screen bold, underline, italics, sub and super script fonts as you type. The spreadsheet includes a sideways printing feature as well as 16 digit accuracy, plus a graphics module to produce bar, line and pie charts quickly and easily from your data. The database includes a report writer to create your own professional reports. Full details available on request. Super Pack 2 by Digital Solutions Inc is available for only **£64.95**

## Super Disk Librarian

Super Disk Librarian will catalogue up to 1,000 disks and 15,200 programs. Do you have a lot of disks full of programs? Have you ever lost a program which you knew you had somewhere? Then Super Disk Librarian will provide you with a simple means of sorting and indexing the file names. Once the disks have been catalogued, numerous reports and lists can be printed and the library sorted and searched. Super Disk Librarian for the Commodore 128. **Only £29.95.**

## The CP/M Kit & Users Guide

The CP/M Kit introduces and explains the unknown, third mode of the C128. The CP/M Users Guide is a 300 page book by Abacus Software covering all aspects of CP/M. Subjects which include the system disk, resident commands and disk copying are described in detail. The CP/M kit contains over 20 CP/M programs including a word processor, chess game and a disk cataloguing program accompanied by a detailed guide to running programs in CP/M. The CP/M kit and Users Guide.
**Only £34.95.**

## Super Disk Utilities

The ultimate utilities disk for the 1571 disk drive and C128 computer. Copy whole disks with 1 or 2 drives, change disk format, perform CBM DOS, CP/M and MS-DOS utility functions, scratch, unscratch, lock and unlock files, write protect disk, contains disk editor, drive monitor, unique RAM writer and more.
**Only £24.95.**

## Merlin 128

Merlin, a complete macro assembler editor system for the 128. It includes a full screen editor, sourceror to disassemble programs, print filer to save assembled listings as text files and a relocating linker. It supports local and global labels, entry and external label definitions, and includes several macro libraries. Merlin 128 is supplied with example programs and a detailed manual.
**Only £49.95.**

| | | | |
|---|---|---|---|
| ● Commodore 1351 Mouse | £29.95 | 1750, 512K RAM Pack | £149.95 |
| Chartpack 128 | £29.95 | Commodore 128D | £374.95 |
| CADPAK 128 | £29.95 | 1571 Disk Drive | £184.95 |
| Super C | £39.95 | 1901 Monitor | £210.95 |
| Cobol 128 | £29.95 | Anatomy of 128 | £9.95 |
| RAMDOS | £29.95 | Anatomy of 1571 | £9.95 |
| Word Writer 128 | £39.95 | Peeks and Pokes | £9.95 |
| Swiftcalc 128 | £39.95 | CAD on 128 | £9.95 |
| Data Manager 128 | £39.95 | Tricks and Tips | £9.95 |
| Fontmaster 128 | £49.95 | Studio Payroll | £39.95 |
| GEOS 128 | £32.95 | Micro Clerk | £39.95 |
| Super Base | £29.95 | Xref | £12.95 |
| The Great War | £14.95 | Cannonball 128 | £29.95 |
| Vizastar | £74.95 | Page Illustrator | £29.95 |
| Vizawrite Classic | £54.95 | | |
| Partner 128 | £49.95 | | |

Access VISA

● Order with Access, VISA, cheque or Postal Order, COD and Express delivery available, foreign orders add £2.50 per package. Prices include VAT and postage. Please allow 14 days for delivery.

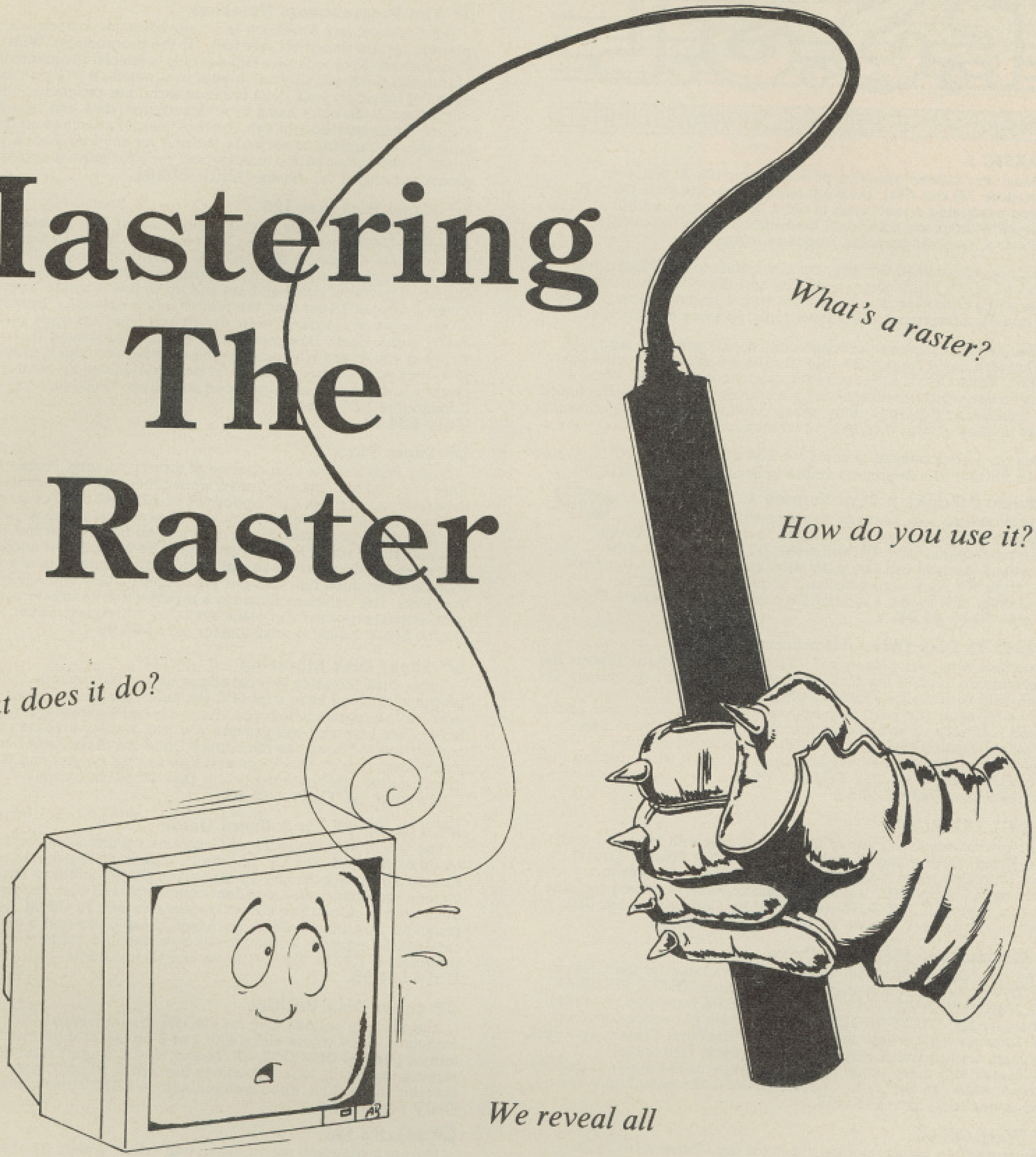
**18 High Street · Pershore · Worcs · WR10 1BG · Tel: (0386) 553153**

# Mastering The Raster

*What's a raster?*

*How do you use it?*

*What does it do?*



*We reveal all*

An interrupt is a short routine which is repeatedly executed during the main program but independently from it. Once the interrupt program (routine) has been dealt with (serviced), the main program continues as before. A simple allegory would be a man sitting at his desk, writing a letter when the telephone rings, he answers it and deals with the call, then he continues writing. In this example, the main task is the writing of the letter and the interrupt is the answering of the telephone. It is worth noting that an interrupt can influence or halt the main program through the alteration of memory locations, just as the telephone call could influence the man's letter.

An interrupt can be compared to a sub-routine but is much more powerful since it does not need any command in the main program to call it.

The Commodore 64 has four types of interrupt, which are;

reset
NMI (Non-Maskable Interrupt)
BRK (BReaK)
IRQ (Interrupt ReQuest)

The interrupt we are interested in, the raster, is an IRQ interrupt. This is a general term to describe *maskable* interrupts which simply means that they can be turned on and off using the following assembly language instructions:

SEI (SEt Interrupt flag)
CLI (CLear Interrupt flag)

SEI is used to disable the interrupts, while CLI is used to enable them.

We can also determine which sources will trigger an IRQ and the four main ones are: sprite to sprite collision, sprite to background collision, light pen and raster line. We are only interested in the raster.

## What is a raster line?

A Commodore TV picture, or raster, is made up of 280 very fine lines. These are redrawn twenty times a second to create the impression of a moving picture. Each one of these lines is a raster line and a program can determine which line is being drawn by reading register 18 of the VIC chip, the raster register.

The top and bottom of the screen are usually around 30 and 280 respectively, although it varies on different TVs and monitors. The limits of the text screen, however, are always fixed at 40 and 240.

Here we see a problem, the raster line can be as high as 280 but the maximum number that a single register can hold is 255. An extra bit is needed so bit 7 of register 17 is used as the MSB of the raster line.

The VIC allows an interrupt to be generated when the screen display reaches a certain line. To cause this to happen correctly, we must first do three things:

1. We must tell the computer the screen line at which the routine should occur. This is done by writing the desired line number to register 18, the raster register, remembering to use bit 7 of register 17 as the MSB.

2. We must tell the computer that an interrupt is to be generated by the rasters when it reaches that line. This is done by using VIC register 26. This location is called the IMR (Interrupt Mask Register) and unless the bit which corresponds to the desired interrupt is set, along with bit 7, an interrupt will not be generated. The bits have the following significance:

Bit 0 – raster interrupt
Bit 1 – interrupt by sprite-background col.
Bit 2 – interrupt by sprite-sprite col.
Bit 3 – interrupt by lightpen
Bit 4 – to 6 are unused
Bit 5 – must be set if an interrupt is to occur

Therefore to inform the computer to generate an interrupt by raster, we would set bits 0 and 7 of the IMR. This could be done using the following commands:

```
LDA   %10000001
STA   IMR
```

3. Now we come on to a slight problem which involves register 25, the IRR (Interrupt Request Register). This is used to indicate the source of an interrupt if more than one is active. If bit 7 is set then an interrupt has been generated and you can determine which type by checking bits 0 to 3 which have the same significance as in the IMR. However, the problem lies in the fact that if this register is not cleared by the interrupt routine then another interrupt will be generated as soon as the routine is finished and the computer will crash. The register can be reset by reading it and then writing the same value back to it like this:

```
LDA   IRR
STA   IRR
```

To recap, this is how to generate a raster interrupt at line 100:-

```
LDA   #100          ;store the line
                    number
STA   VIC+18        ;in the raster reg.
LDA   VIC+17        ;and erase bit 17
AND   #%01111111    ;set bits 0 and 7
STA   VIC+17
LDA   #%10000001    ;set bits 0 and 7
STA   IMR           ;of the IMR
```

The interrupt will now take place, and the first commands of the routine should be:-

Now you now how to generate an interrupt, but there are still some important things which must be explained, such as what happens during an interrupt and where the routines can fit in.

## What happens during an interrupt?

We have seen that, when an interrupt is generated, a routine is executed and then the main program continues, but we must let the computer know where the routine is. We do this by using the IRQ vector which contains the address of the interrupt routine. It is located at 788/789 ($0314/$0315) and usually contains the address $EA31. This points to an address in ROM which checks the STOP key, increments the clock and flashes the cursor. If you want these functions to continue, you must check the IMR to see if one of its sources generated the interrupt. If it didn't, the program should jump to $EA31. The address of the routine is stored in the IRQ vector in normal lo-hi format.

When changing the IRQ vector, set the interrupt flag first and clear it when you are finished. If this isn't done, an interrupt may occur when only half of the address has been changed, the program would then jump to some unknown address and would probably crash.

Now that we can cause an interrupt and know how to generate one, the only thing which remains is to mark the end. This is done using the assembly language command RTI (ReTurn from Interrupt) but one more consideration must be taken into account. In order that the main program can continue unaffected, we must first save the registers by pushing them onto the stack (the program counter and flags register are saved automatically). This of course means that before we use RTI, we must first restore the registers by pulling them from the stack, as shown below:

```
PHA          ;save accumulator
TXA          ;then save
PHA          ;X-register
TYA          ;and finally
PHA          ;the Y-register
...
...          ;perform interrupt
...          ;routine
...
PLA          ;restore registers
TAY          ;making sure that
PLA          ;they are in the
TAX          ;right order
PLA          ;and then
RTI          ;return from
             interrupt
```

This is all the knowledge that is required to construct a raster interrupt, however, there are a few guidelines to programming them that you should be aware of.

Firstly, you need to write a short initialisation program. This will only be run once, and will be responsible for the setting up of the first interrupt. During this, the IRQ vector will be changed, the IMR written to and the raster line set. Do not forget to set and clear the interrupt flag during this.

Secondly, after saving the registers, you must have a program which will

determine which source has generated the interrupt and act accordingly. This is needed because there are the four sources we have already mentioned plus the system interrupt (the one responsible for flashing the cursor etc.). This program should also be responsible for clearing the IRR.

Thirdly, we write the interrupt routine, or routines, and at the end prepare for the next interrupt, before restoring the registers and returning. This preparation for the next interrupt is only the setting of the next raster line – the IMR does not have to be reset.

## Practical Examples

The first of the two example programs which I have included is very simple, but is a useful example of how the raster works. It allows three background colours to be used simultaneously and, though this can be achieved using extended colour mode, interrupts don't have the disadvantage of this mode.

The program works by changing the values in 53280 and 53281 when the raster reaches lines 0,100 and 200. When you type in the program and run it, this can clearly be seen as you will now have a three-tone screen. The colours can be changed by poking locations $C038 (49208), $C04F (49231) and $C056 (49238). Fig 1 shows how this routine works.

| Lines | |
|---|---|
| 80 – 200 | These lines are used to set up the variables. |
| 220 | is the start address – $C000 (49152). |
| 240 – 370 | This is the initialising routine which sets things up. It changes the IRQ vector to point to TEST. |
| 400 – 460 | This is the test to check that the interrupt is by raster line. Since, in this case, the only other possible interrupt source is the system interrupt, we branch to it if interrupt is not by raster. |
| 480 – 500 | These lines are the first test to determine the line. If it is greater than 100 the program jumps to test for the other two lines. Otherwise, it continues. |
| 520 – 530 | This sets things up for the main routine. The colour is put into the accumulator and the next raster line into the X-register. |
| 540 – 570 | This is the main routine where all the work is done. The already prepared value of the colour and raster are put in the proper places. |
| 590 -640 | This restores the registers and returns from the interrupt. |
| 670 – 740 | These lines sort out the colours and raster lines for the COLOUR routines. |

Another thing to note about this routine is that the main work section (lines 550-570) is only written once although in this case it is small. You should always try to make the main routine small with as little work to do as possible.

If you want to use this program as part of your Basic program, you can change the three colours by poking the colour into 49208 for the top colour, 49231 for the middle colour and 49238 for the bottom colour.

The second example is built around the same core, in fact line 10-500 are almost identical. This is because exactly the same procedures should be used each time.

The program gives 16 sprites simultaneously on screen. It works by copying the values from a table of sprite positions into the VIC registers when the line is at zero. Then, when the line reaches 130, new data is fetched from a second set of values. This is done continually so that the illusion of 16 sprites is created although the real number on screen at one time is actually eight. Fig 2 shows how this routine works.

| Lines | |
|---|---|
| 500 – 540 | These lines prepare the registers for the main routine. The X-register again contains the next raster line number, but this time the address of TABLE1 is stored at locations $FB and $FC. |
| 500 – 620 | This is the main COPY routine. It sets up a loop and transers the 16 values from the predefined table and copies them into the first 16 registers of the VIC. It then sets the raster for the next interrupt. |
| 640 – 690 | These lines are used to restore the registers. |
| 720 – 770 | These lines are used to prepare the registers. |
| 720 – 770 | These lines are used to prepare the registers when the other table of values is required. It works as lines 500 – 540. |

Again, you will notice that the main routine is only written once and the registers are prepared for it. This is slightly more complicated than in the first routine but should not be too difficult to understand because the principles are the same.

To use the program from Basic, you must first load and execute it using SYS 49152. You then put the values of your sprite positions into the two different tables, in the same format as the normal registers. The tables are located at 49408 ($C100) and 49664 ($C200).

Now for the drawback of this method. Since the first set of sprites are switched out at line 130, any sprite from the first data set which crosses this line will be cut off at that point. For the same reason, any sprite from the second set which gets too close to the line will disappear completely.

The guidelines should be that, for set one, the sprite's Y co-ordinate should not be more than 108, and for set two, it's Y co-ordinate should not be less than 135.

This example is only a very simple one and you are free of course to copy the sprites' colours, pointers and anything else you feel like copying.

In this article I have presented the necessary information to write your own raster routines. I have also included two simple examples to help you get the hang of things and I think you'll find that, if you use the raster well, it can be an immensely powerful aid to programming.

# Bombuzal

Here I am on the kitchen floor. Well, I think it's the kitchen because there's plenty of tiles round here. Some are plain, some are rivetted, some have slots, others dissolve when you step on them and some are covered in ice. Whoops! Yes, it's definitely the kitchen. Who left the fridge open?

That's strange, I never noticed these funny ball-shaped things before. Mmm! smooth as a baby's ... Hello what's that ticking? I'm not hanging about to find out.

Wow! That was close. Did you see that? It just blew up and took half the floor with it. Ah! another new tile what does this doooo...

...I see, it's a teleporter. Those nice people Dave Bishop and Tony Crowther never told me it would be like this.

I think it's starting to make sense. These balls are bombs and there appears to be three types: those that go whap when you touch them, those that need to be detonated and the last type which appear to be joined in some sort of suicide pact – set one off and they all go up.

Within these categories there are three sizes: small, medium and goodbye world. Oh! There's one over there that keeps changing its mind. Large, medium, small, medium, large, medium – fickle creature.

Here's a tile with a switch. I'll shut my eyes and pull it...nothing happened, or did it? I don't remember that tile being over there before. I think I'm getting the hang of this. Explode a bomb and you set up a chain reaction. If I plan it right I bet I could clear this room in no time. I'll just step on this rotating tile and...Aaaargh!




## Meanwhile...

Image Works' latest game is one of those puzzles which always seems to get critical acclaim but doesn't sell in vast quantities. The aim is to clear each room of bombs without blowing yourself up. Each bomb type behaves in a different way and the bigger they are the more havoc they create.

Immediately around each bomb is a devastation area and any tiles within this zone are totally destroyed. The blast from each bomb covers about twice the destruction area and any bombs within the blast pattern are also detonated. This can have a devastating effect on the scenery and, if care isn't taken, the disruption can prevent the completion of a level.

After every bomb has been exploded, the number of tiles remaining, is multiplied by ten and the result added as a bonus to the score. So, the aim is maximum havoc with minimum destruction.

Careful use of the feature tiles enables the player to teleport, move certain bombs around along special grooves or animate Bubble and Squeek, two sacrificial robot helpers.




There are two version of the game, 3D and 2D. The 3D game looks very good in screen shots but is a real pig to play. Apart from appeasing the press. I can't think why it was included. Give me the 2D version any day.

As a diversion from the Christmas deluge of shoot-em-ups, it's nice to exercise the grey matter for once and, with around 300 screens, my solitary brain cell will be stretched tighter then the skin on our paltry Christmas poultry.

Anorak-toting trainspotters may be interested to learn that screen 40 blasts down to spell the letters YCBM. Now who could that be?

Cheats might like to try working out when to press the CBM key, the fire button and then the RUN/STOP key and Q. Once you work that out, the plus and minus keys will take you to any screen you fancy.

A brilliant game but will genius reap financial rewards?

**Karly Fowler**

***Touchline:***
***Title:*** *Bombuzal.* ***Supplier:*** *Image Works, Headway House, 66-73 Shoe Lane, London EC4P 4AB.* ***Tel:*** *01-377 4645* ***Machine:*** *C64.* ***Price:*** *£9.99 (cass) £12.99 (disk).*

Bombuzal

# TOTAL BACKUP POWER
# Now ACTION REPLAY

## NOW EVEN MORE POWERFUL, MORE FRIENDLY AND WI[TH]...

**ONLY £29·99 POST FREE**

**Action Replay works by taking a *'SNAPSHOT'* of the program in memory so it doesn't matter how the program was loaded – from tape or disk – at normal or turbo speed.**

- **WARP 25. THE WORLD'S FASTEST SERIAL DISK TURBO – NOW EVEN FASTER! LOADS 200 BLOCKS IN 6 SECONDS! 240 BLOCKS IN 7 SECONDS!** – that's even faster than some parallel systems. Built into the cartridge – no extra hardware or software required. Includes supercast, warpsave, scratch, filecopy/convert. Integrated with normal disk turbo for supercompatibility – auto detects warp or normal format so no special load commands are required. Turbo and Warp 25 speed are entirely independent of the cartridge with SUPERBOOT.
- **SIMPLE TO USE:** Just press the button and make a complete backup – tape to disk, tape to tape, disc to tape, disk to disk. THE PROCESS IS AUTOMATIC – JUST GIVE THE BACKUP A NAME.
- **TURBO RELOAD.** All backups will reload at turbo speed, COMPLETELY INDEPENDENTLY OF THE CARTRIDGE.
- **SPRITE KILLER.** Make yourself invincible. Disable sprite collisions – works with many programs.
- **PRINTER DUMP.** Freeze any game and print out the screen. Eg. loading picture, high score screen etc. Works with most printers. MPS 801, 803, Star, Epson etc. Double size, 16 shades, reverse print option. Very versatile – no user knowledge required.
- **PICTURE SAVE.** Save any Hires multicolour screen to disk at the push of a button. Compatible with Blazing Paddles, Koala, Artist 64, Image System etc.
- **SPRITE MONITOR.** Unique Sprite monitors allows you to freeze the action and view all the sprites, watch the sprite animation, save or delete any sprite. Load sprites from one game into another to make customised programs.
- **POKES/CHEAT MODE.** Press the button and enter those pokes for extra lives etc., then restart the program or make a backup. Ideal for custom games.
- **MULTISTAGE TRANSFER.** Even transfers multistage programs from tape to disk. The extra parts fast load – a unique feature. Enhancement disk available for non standard multi-loaders (see below).
- **SUPER COMPACTOR.** Ultra efficient program compaction techniques. Each program saved as a single file. 3 programs per disk side – 6 programs per disk, if you use both sides.
- **TEXT MODIFY.** Change title screens, high score screens etc. Put your own name into a game then restart it or make a backup to tape or disk. Very simple to use.
- **MONITOR.** Full feature 'Floating' type MACHINE CODE MONITOR. All standard features plus many more:- assemble, disassemble, hex dump, interpret, transfer, compare, fill, hunt, number conversion, bank switching, relocate, load/save etc. Uses no memory. Full printer support.
- **DISK MONITOR.** A special monitor for use on the RAM inside your disk drive. All the usual commands – a useful hacking tool.
- **WHOLE DISK COPY.** Copy a full unprotected disk in under two minutes with only one drive.
- **FAST FILE COPY.** Works with standard and Warp 25 files of up to 249 blocks. Converts formats to and from Warp 25.
- **FAST FORMAT.** Under 20 seconds.
- **TOOLKIT COMMANDS.** A whole range of useful new commands including: AUTO LINE NUMBERING, DELETE, MERGE, APPEND, OLD, LINESAVE, etc., PRINTERLISTER – list any program (including directory) directly from disk to printer or screen without corrupting memory.
- **REDEFINED FUNCTION KEYS.** Single stroke commands for operation of many common commands including: LOAD, SAVE, DIR. Load from directory – no need to type in filename.
- **TAPE TURBO.** Designed to make turbo load/save for your own programs. No screen blanking during loading.




***REMEMBER*** all features are built in and available at the touch of a key. All features work with both **TAPE** and **DISK.** (Except multipart transfer & disk file utility).

### ACTION REPLAY ENHANCEMENT DISK

The biggest and best collection of special parameters and file copy programs for transferring non-standard multi-load tapes to disk – games like **LAST NINJA, CALIFORNIA GAMES, LEADERBOARD, DRAGON'S LAIR** – SEVENTY titles in all. Almost all major titles covered. Latest edition includes **COMBAT SCHOOL, PLATOON, PREDATOR, GAUNTLET II, TESTDRIVE, SKATE OR DIE, APOLLO 18, THE TRAIN** and many more. Cheats for infinite time, lives etc. The **GRAPHIC SLIDESHOW** – latest edition displays multicolour pictures or loading screens saved by Action Replay or any major Art Package – Blazing Paddles, Koala, Advanced Art Studio, Artist 64 etc. Lots of fun. Only **£7.99**. Upgrades – send £3.00 plus old disk.

# …TAKES A QUANTUM LEAP
# …MK IV HAS ARRIVED!

**FOR CBM64/128**

## …BACKUP MORE PROGRAMS THAN ANY RIVAL UTILITY.

***BUT THATS NOT ALL ... NOW AVAILABLE FOR THE SERIOUS PROGRAM HACKER***

**ACTION REPLAY IV 'PROFESSIONAL'™**

**● All the features of the normal Action Replay IV but with an amazing on board LSI LOGIC PROCESSING CHIP. Plus 32K operating system ROM and 8K RAM CHIP. The first RAM/ROM based cartridge of its type!**



***ALL THE MK IV FEATURES PLUS ...***

**● FULLY INTEGRATED OPERATION.**
The MK IV 'Professional' has all the features of the MK IV plus an onboard custom LSI LOGIC PROCESSING CHIP that integrates the whole range of utilities and makes them available at the press of a button at any time.

**● EXTENDED MONITOR.**
The 'Professional' has an extra powerful machine code monitor. Because it has both ROM and Ram at its disposal the Professional can freeze any program and then examine the WHOLE OF COMPUTER MEMORY in the frozen state including screen RAM, ZERO PAGE and STACK.
Full feature disassembly, compare, fill, transfer, hunt, relocate, jump etc, etc. In fact all the features of the best fully blown monitor available. Return to the frozen program at the press of a key at the point you left it! An absolute must for the program hacker – or even the programmer who needs to de-bug his program.

**● INTELLIGENT HARDWARE**
The Professional hardware is unmatched anywhere in the world today. The special logic processing chip can cope with protection methods as they appear by reacting to its environment.

**● RAM LOADER**
In addition to Warp 25, the AR4 Professional now has RAM LOADER. Making use of its onboard 8K Ram the Professional can also load commercial disks directly at up to 25 times normal speed. Remember this feature is in addition to AR4's unique Warp 25 feature that reloads all backups at 25 times speed.

**MK IV PROFESSIONAL ONLY £34·99 POST FREE**

**WARP 25** Reloads an average BACK-UP in 6 Seconds!!

### UPGRADE INFORMATION

**MK III TO MK IV. Just send £9.99 and we will send you the new MK IV Chip to plug into your cartridge. Fitting is very easy.**
**MK III TO MK IV 'PROFESSIONAL'. Send your old cartridge plus £19.99 and we will send you a new Professional MK IV.**

MK 2 Action Replay owners can get £10 as part exchange against either the MK IV or Professional. Send old cartridge plus balance.

### PERFORMANCE PROMISE

Action Replay will backup any program that any other cartridge can backup – and more! It also has an unmatched range of onboard features. Before you buy check our competitors ads to see what they offer and see how many of the Action Replay MK IV features are either not there or have to be loaded from Supergate disks etc. When you buy Action Replay if you don't find our claims to be true then return it within 14 days for a full refund.

ALL ORDERS NORMALLY DESPATCHED WITHIN 48 HRS

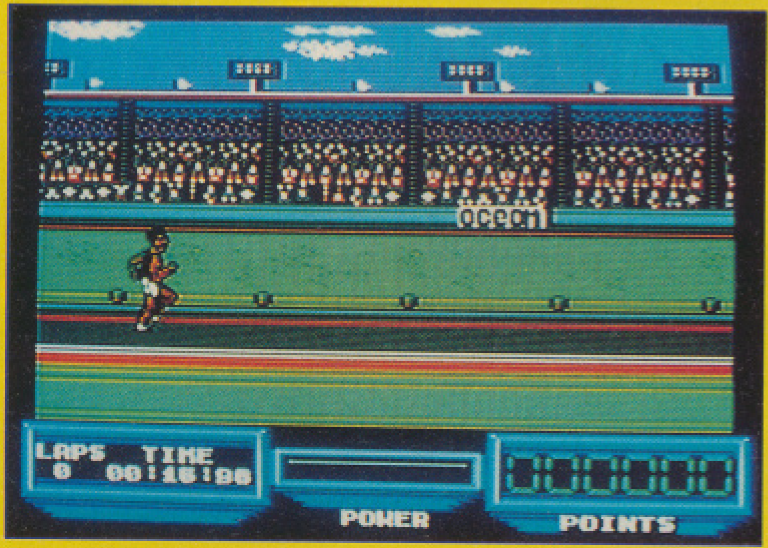
## HOW TO ORDER ...

| BY PHONE | BY POST | UK ORDERS POST FREE |
|---|---|---|
| 0782 744707 24 hr Credit Card Line | Send cheques/PO's made payable to 'Datel Electronics' | EUROPE ADD £1.00 OVERSEAS ADD $3 |
| | | FAX 0782 744292 |

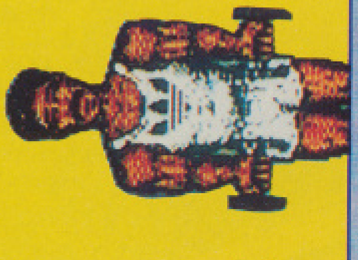
## DATEL ELECTRONICS

DATEL ELECTRONICS LTD, FENTON INDUSTRIAL ESTATE, GOVAN ROAD, FENTON, STOKE-ON-TRENT, ENGLAND

| SALES ONLY | TECHNICAL ONLY |
|---|---|
| 0782 744707 | 0782 744324 |




# Daley Thompson's Olympic Challenge



Daley is back, in a game launched to coincide with his attempt to become the only man to win three Olympic gold medals in the toughest event of them all, the Decathlon.

As everyone now knows he failed and had to settle for fourth place. However, he will still be regarded by many as one of the greatest athletes of all time.

Now you can better his performance, as Ocean, once again, is first off the blocks with an Olympic game. It was four years ago that Ocean released Daley Thompson's Decathlon and set into motion the whole sports' game bandwagon that company after company has jumped on. There was even a second Daley game, Daley Thompson's Supertest, but by then the Olympic fever was over but, now that it's back, Ocean is first off the blocks with Daley Thompson's Olympic Challenge.

Once more, this is a game that will test both you and your joystick, as the speed of waggle has a decisive effect on your chances of Gold by reaching the 9000 point total that will smash the world record.

However, it's now four years later and Ocean realise that a waggling game is no longer enough, so there are strategy elements thrown in to see whether your brain is still working, and you also have to get fit before the Games. These not only help the game considerably but also keep the various sponsors happy because the energy that you build up in the gym is represented by cans of Lucozade and the strategy element involves choosing the right sports' shoe for the job and, yes you've guessed, they are all Adidas shoes.

In the gym, you must work out at the weights and situps to build up enough strength and power to tackle ten gruelling events.

Soon, you're ready for the start of the 100 Metres. The gun fires and you're off. You waggle as fast as you can and cross the line in a disappointing 15 seconds. Your coach doesn't think you can win and so the game ends for you. Are you going to let this get you down? Of course, but soon you're back for a second go and this time you pick the right pair of unmarked shoes. Instead of running in a pair designed for high jumpers, you've got the sprinter's which let you fly, qualify and chalk up 900 points.

You'll need the same combination of waggling speed and skill to compete in the 400 Metres and the last event, the 1500 Metres, but you'll be pleased to know that you only need slow joystick movements to make the pace until the final, frantic sprint.

Timing is the important factor in the high jump, long jump, hurdles and pole vault, where you must waggle to build up speed and then press fire when you're ready to jump. As before, having the right type of shoes and building up enough strength in the gym is enough to carry you through.

Similarly, the javelin, shot and discus require speed in the wind up plus timing and power in the throw. As in all the events, the faster you move, the further you get and the more points you score, but if you don't reach a sufficient standard then the game will end.

Overall, Daley Thompson's Olympic Challenge is a worthy successor to the record-breaking game of four years ago and should test a few joysticks to destruction. If Daley is going to attempt another decathlon Gold in Barcelona, I'm sure Ocean will be training their programmers for Daley Thompson 1992.

**Tony Hetherington**

***Touchline:***
***Title:*** *Daley Thompson's Olympic Challenge.* ***Supplier:*** *Ocean, 6 Central St, Manchester M2 5NS.* ***Tel:*** *061-832 6633.* ***Price:*** *£8.95 (cass).*

# Choosing an Assembler

*Assemblers are essential programming aids so we offer counsel to the aspiring machine coder*

***By Gordon Davis***

There's currently a tremendous revival of interest in high-level languages, particularly on fast, high-capacity micros like the Amiga. On these machines it's possible to run some very advanced compilers that will enable your C, Basic or whatever to run at C64 machine code speeds. This is cold comfort for people like us who are still hacking away on the C64. For us machine code is a must. There's certainly no other way to get those real-time speeds that we all crave.

If machine code is a must, then so is an assembler of some sort. Although there may well be some hardy people out there who are still programming in hex or on some tiny assembler, the only route to real productivity is to use a proper symbolic assembler.

## Talking to the Chip

As anyone knows, an assembler is just one way of rendering comprehensible the built-in binary instructions which only the machine's CPU can understand, the 6510 in this case. All assemblers require the entry of a source code which uses three letter mnemonics for binary machine code instructions. These are then converted into machine-readable object code.

Beyond this, a wide variety of extra instructions can be added; some of which are essential, some not. I mentioned symbolic assembly, and this is definitely essential.

Firstly, symbolic assembly gives you the ability to assign values to alphanumeric labels which you can use later on in the source code as operands and so on. Values are usually assigned using the EQU (equate) statement at the start of the code. This means that the alterations need only be made in one place in the program to change it all.

Secondly, and probably more importantly, labels are vital when it comes to assigning flow of control within a program. Branch relative instructions can be impossible otherwise. These have to have an operand indicating a jump of between +127 and -128 bytes from the instruction.

You really do not want to have to recalculate relative branches every time you change the program, so a symbolic assembler will allow you to assign a label to an instruction. When the source code is assembled, the assembler will automatically calculate the relative branch to that address and assign it to that operand.

## Knobs and Buttons

Like stereos, assembler programs may have all the knobs and buttons you need. Also like stereos, too many of these may simply confuse the beginner.

Look for the buzzwords: 'Two-pass'. This simply means that the assembler is symbolic – there's no way that you can assign values to labels without two scans through the source code.

One way to assess the strength of an assembler is the power and range of the 'pseudo-opcodes' that the assembler uses. We've already met one pseudo-opcode, namely EQU. It's a three-letter code, like LDA, PHP or any 6510 mnemonic, but it doesn't produce 6510 object code, merely tells the assembler to do something at 'assemble time'.

These codes are commonly known as assembler directives. All symbolic assemblers will have the directive EQU, but they vary widely with respect to others. A wide variety is possible when it comes to data opcodes. Supersoft's Mikro has only three data directives, WOR, BYT and TXT, which allow you to specify data as two-byte words, single bytes or strings. By contrast, Zeus64 has seven such directives.

## Monitors

Once you've written your source code and assembled it, you'll very likely want to debug it so one of the most vital extras is a monitor. Most assemblers do come complete with these but they vary vastly in their capacities.

A monitor may come with a small repertoire of commands: machine code load/save, step, trace, register dump, and so on. On the other hand, the Laser Genius Analyser is an incredible piece of software, hardly a monitor at all. It can even be programmed in a subset of Forth.

Mention of Laser Genius assembler brings us to two other buzzwords, macro and conditional assembly.

Macro assembly is a way of producing more compact source code. It allows you to set up a chunk of code that may be used more than once through a single keyword, which you can drop in wherever you want. The full listing is expanded out at assemble time.

Conditional assembly, on the other hand, means that you can set or unset switches in the source code, which enables you to control very closely which parts of the code are assembled at any one pass. Of all the assemblers I know, only Laser Genius supports both macro and conditional assembly.

## Getting one in

The trouble is, once you've decided what you want from an assembler, there's precious little choice available these days. Historically, a very large number of assemblers have been produced for the C64, many of them excellent. The unfortunate thing is that most of them are no longer easily available although some remainders may still be found in the shops. This is due to the small margin involved in selling systems software. Companies that specialise in this area have a tendency to either move on or die.

As far as I can make out, the choice of easily available products comes down to just four products. There may be more but if I've left anyone out it's because they simply haven't bothered promoting the product properly. The four are Mikro from Supersoft, the catchily named YER6502ASM from York Electronic Research, the Merlin 128 assembler from Financial Systems Software and Speedy Assembler which is from none other than us, Your Commodore.

The Merlin C128 is a well-regarded C128 assembler which we reviewed a couple of issues back and there is a C64 version available in the US but not, as yet, in the UK.

I don't want to say a lot about Speedy Assembler, our product, except that it is, of course, powerful, very reasonably priced, bug-free (well almost), amazingly well-documented, and that every purchaser has the chance to win a night out with Stuart Cooke, the notorious bon vivant, raconteur, Your Commodore editor, and an incredibly wonderful and warm human being. This man is nothing short of a s... (That's quite enough – I feel sick. SUB-EDITOR).

Ahem. Seriously though, I can say that Speedy Assembler has one unique feature, namely a second symbol table which provides global references across a whole set of source files. In general form, it broadly resembles the late, lamented Zeus64 assembler.

Supersoft's Mikro may well appeal strongly to the first-time machine coder. It offers the convenience of being on cartridge and is simple, but adequate, and includes a monitor. The one drawback is the price, which is a little on the high side for this sort of product.

The YER product is considerably cheaper, but much more spartan. There is no monitor and a minimum of pseudo-ops and utilities. It is, however, a true symbolic assembler and can be recommended to the beginner for its low price.

## Alas...

Just because a product isn't being marketed doesn't mean that you won't be able to find it. Copies may be gathering dust in a computer store or second-hand shop. Some excellent assemblers may turn up this way and I'd just like to mention three.

An honourable mention for the Commodore Macro Assembler, one of the earliest marketed and from Commodore itself, very usable for the price and still in use, as far as I can make out, by a large number of our readers.

My personal golden oldie is Zeus64, the one which I started out with. This has very clear documentation, and contains enough features to place it midway between simple beginners' packages and professional assemblers.

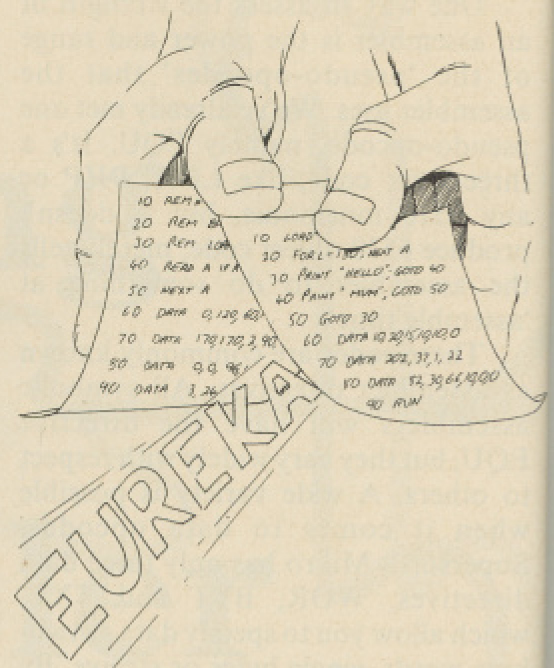
Laser Genius is one of the latter. This is an extraordinary package with every one of the bells and whistles you could want. LG is a tripartite package: assembler, monitor, and that Forth-based analyser I mentioned earlier. The assembler's got the lot, including macro and conditional assembly. I wouldn't recommend it for beginners but the 69-page manual is comprehensible if terse.

Look out for it – you may be lucky. The package was marketed by Oasis Software but it got dropped and disappeared recently. With some solid marketing it could have swept the field.

So there we are. Excellent as many of the currently available products are, they are, for the most part, not as sophisticated as the software of yesteryear. The message is to keep looking through those remainder bins.

***Touchline:***
***Product:*** *Mikro Assembler.* ***Supplier:*** *Supersoft, Winchester House, Canning Rd, Wealdstone, Harrow.* ***Tel:*** *01-861 1166.* ***Price:*** *£57.70.*
***Product:*** *YER 6502 ASM.* ***Supplier:*** *York Electronic Research, The Fishergate Centre, 4 Fishergate, York YO1 4AB.* ***Tel:*** *(0904) 610722.* ***Price:*** *£12.99.*
***Product:*** *YC Speedy Assembler.* ***Supplier:*** *YC Readers Services, ASP Ltd, 9 Hall Rd, Hemel Hempstead, Herts.* ***Price:*** *£6.00.*

# Creating Characters




*Create better print quality for your Plus/4 with this handy utility*

***By Frank Carson***

The Plus/4 and MPS 803 with built in software provides a wordprocessor package at a price even my wallet approves of.

The MPS 801-803 printers leave a lot to be desired and any method of improving the output is very welcome.

In the February 1987 issue of *Your Commodore*, the program 'Word-Pro Add-On' was published which vastly improved the printout of these lowly machines.

The reasoning behind this program was to incorporate the *Serious User Guide* (1987) descender set into the Plus/4 wordprocessor and to combine the two programs. The Word-Pro Add On program uses the bit image printer mode to reform certain characters and the underline.

## Entering M/C Code

This is a complete machine code program and is entered using the built in M/C monitor. For information regarding the monitor refer to Section 5 of the Plus/4 User Manual. The four listings in this program will be located between memory locations $7000 to $7AFF. To use the monitor print M then Shift +0 and press Return. The monitor status will then be displayed. The section of memory we require can now be filled with zeros. Enter F7000,7AFF,00 and press Return.

Enter M7000 and press return. The contents at $7000 will appear (all zeros). The first line can now be altered (List 1 $7000 to $72FF).

```
>7000 80 80 80 80 80 80 00 00   Return
>7008 80 80 80 DE 80 80 00 00   Return
>7010 and so on
```

The new data is now in memory. Recheck the data and alter any errors as you go along. This data can be stored on disk at any time. S"name",8,7000,7AFF return.

**NB.** In this mode files can not be updated – a new name each time! One system is to use the day and the location. Such as "THU$7098" "THU$7130" etc. To load the file from the monitor: L"THU$7130",8 Return. Then M7130 return. This will display the next location for data entry.

List 2 is very short $7530 to $7547
List 3 is a little longer $7600 to $76AF
List 4 is the main program. $7900 to $7A4F

List 1 was published in the *Serious Users Guide 1987* as a basic program. (New characters on the MPS801/3) DESCENDER SET.) Listings of four other characters sets are supplied or you can design your own sets. Reprints will be available, details later.

## Using Nufont

The program is loaded directly from the keyboard:
LOAD"NUFONT",8,1 Return
SYS30000 return will initialise the program and load the wordprocessor.

This will operate as normal. The reversed printing commands are used with asc codes for enhanced type and underline. (See page 55 of the Plus/4 Software Manual.)

Use asc14; for enhanced mode
asc1; to underline
asc15; to cancel
asc2; to cancel

Documents compiled using Nufont or the standard software are interchangeable. Using the standard software the underiine instructions will be ignored.

The asc commands can be called or cancelled at will. However the Plus/4 software has a mind of its own and you may find a command is ignored.

For instance it may ignore an asc command at the end of a line. In this case the command needs to be inserted at the beginning of the next line.

The Plus/4 makes no allowance for the extra space required in the enhanced mode. This must be taken into account by the operator.

The complete document can be in the enhanced mode but there will be only 40 chars to a line and the equivalent of 24 lines to a sheet. Word wrap will not work.

It is important that any underline or enhance command are cancelled prior to the end of a document. Failure to do so can cause trouble if more than one copy is to be printed.

MPS 801 owners please note: I do not own a MPS 801 however I can see no reason why this program should cause any trouble using the MPS 801.

For those of you without, Reprints of 'Wordpro Add On' (*Your Commodore*, February 1987) and 'New characters on the MPS 801/3' (Serious Users Guide 1987) are available as photocopies from our Readers Services Department at HALF PRICE! £1.50 gets you both articles (normally £1.50 each).

***Touchline:***
*Readers Services Department*
*ASP Ltd,*
*9 Hall Road,*
*Hemel Hempstead,*
*Herts HP2 7BH.*

***See listings on page 62.***

be called
r the Plus/
s own and
ignored.
ore an asc
ne. In this
be inserted
line.
owance for
ed in the
t be taken
r.
t can be in
ere will be
and the
heet. Word

underline
cancelled
ent. Failure
more than

note: I do
ever I can
ram should
MPS 801.
t, Reprints
n' (*Your*
1987) and
IPS 801/3'
1987) are
from our
rtment at
s you both
ch).

*ent*

# Foxx Fights Back

If you're the kind of person who feels more sorry for the pursued rather than the pursuer, then this fox hunt may appeal to you. For the first time the fox gets the chance to answer back – with lead bullets!

Image Works and the programmers, Denton Design, seem to have had their wires crossed over the name of the main character. The packaging sports the name Foxx but the program seems to prefer the more orthodox spelling: Fox. Whichever is correct, the creature is still a mean son of a vixen.

Foxx and his partner are hungry so, armed only with a pistol, it's out of the safety of the den and into the cold, savage world. The world is depicted in superb graphics with parallax scrolling giving an added feeling of depth.

hero can only carry that many. Now Foxx must go back to his lair to unburden himself.

At this point it is an advantage if all of the dogs have been wiped out. There is only a limited number of them and a strategem will help you out here. The best tactic, I discovered, was to gingerly approach the point where the dogs appear. The program seems to have a trigger point where the dogs are loosed and, by treading on this spot and jumping back, only a handful of dogs appear who are then easily wiped out with the pistol. Eventually, you reach that happy state where the onslaught stops and you have a clear path to the fruit and then on the return journey there are only the nutty squirrels to contend with.

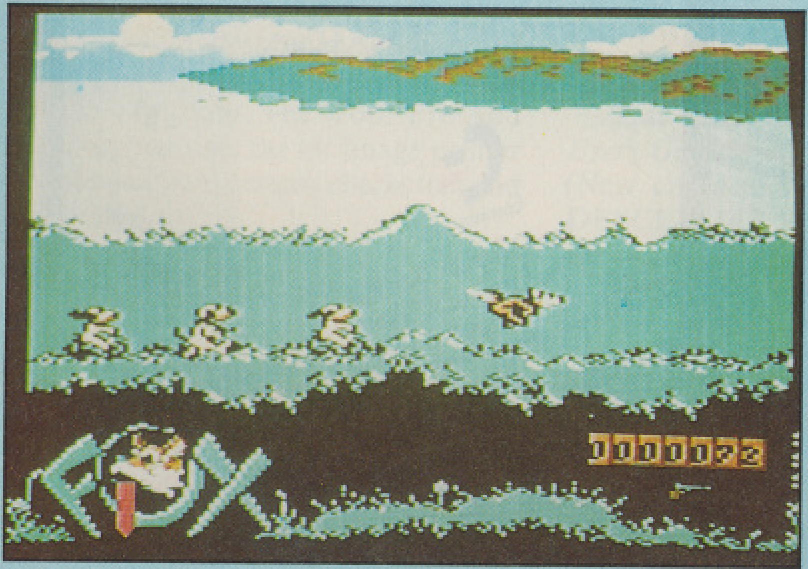
Back at the den, I really started to feel sorry for Foxx. His wife is a real tartar in the sense that she's an acidic source of discontent. After hubby has risked his life for a handful of apples, she sends him on his way with a flea in his ear. Even worse, returning empty handed results in a severe beating with a rolling pin. Absolutely no sympathy, if I were Foxx, I'd have left home long ago.

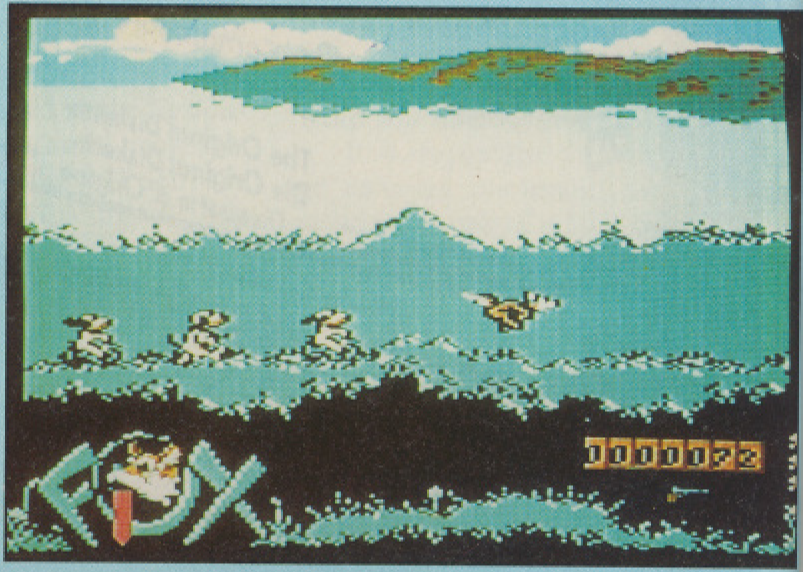
The next phase in the quest for food takes Foxx through the chicken shed. On the way, he passes a rabbit warren which is a handy source of food and a discarded rifle which has a greater range than his pistol.

Tactics in the coop involve leaping onto the nearest wall and blasting away. In this way, fewer chickens have to be shot and that means less likelihood of him being egg-sterminated by a barrage from these foul creatures.

Later in the game, he meets malevolent moles, a stream which must be crossed to reach the lair of the humans, but all the time there are dogs, dogs, dogs.

Foxx Strikes Back is a really enjoyable game to play




Along the way to his first meal, Foxx has to run the gauntlet past malevolent squirrels who are hurling highly explosive nuts down from the trees. As he progresses, the dogs from the local hunt pack swarm around – the Hell's Beagles have found him.

This is the little touch that makes the game. If Foxx outpaces these wretched hounds, they leap on their motorbikes and give chase. Like Foxx's animation, the frames for the dogs give a truly cartoon feel to the game. Full praise must go to Denton Designs who show all of their collective experience gained over years of programming the C64.

Blasting through the pack brings Foxx to the orchard where apples can be picked off the trees. There are only five of them but that's amazingly fortunate because our

but I really must take the advertising department of Image Works to task. They recommend this game to hunt sabateurs as the way to turn the uneatable against the unspeakable. I'm sure that anyone who abhors unnecessary killing will be shocked by the mayhem that a fox armed with a sub-machine gun can cause. Red in tooth, claw and fur, this game is supreme entertainment. **Eric Doyle**

***Touchline:***
***Title:*** *Foxx Strikes Back.* ***Supplier:*** *Image Works, Headway House, 66-73 Shoe Lane, London EC4P 4AP.* ***Tel:*** *01-583 3949.* ***Machine:*** *C64/128.* ***Price:*** *£9.99 (Cass) £12.99 (disk).*

go back

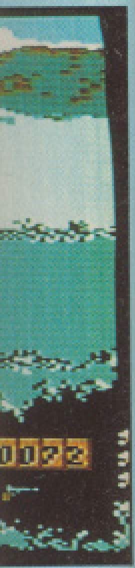
ogs have
of them
st tactic,
where the
ger point
this spot
who are
ou reach
you have
journey

or Foxx.
an acidic
s life for
ith a flea
results in
ympathy,

x through
it warren
ifle which

e nearest
kens have
im being
tures.
a stream
humans,

e to play



t of Image
sabateurs
speakable.
killing will
ith a sub-
d fur, this
Eric Doyle

, *Headway*
*Tel: 01-583*
*.99 (disk).*

# The day Daniel's dad brought his office printer home.



My dad's firm is always busy so he has lots of LC-10 printers at his office.

In fact, he sometimes has so much work to do that he keeps a personal computer in his study so he can bring work home.

But when he's really busy, he brings home one of those Star printers too.

Of course, I know exactly how to use them because we have the colour version at school.

It can print documents in six different colours.

So I'm not surprised WHAT MICRO? called the LC-10 the 'Best Budget Dot Matrix Printer' on the market.

What's more it's a lot less expensive than other printers but much better quality.

(My friend, Philip, even has one for his Commodore.)

For a start the front control panel is child's play.

The six different fonts give you so many different style options when you print things.

It's pretty fast too with a draft elite speed of 144 cps and high density near letter quality at 36 cps.

There's also the LC-10's special feature called 'push-tractor' which gives the lowest tear-off position of the paper.

And you can park continuous paper and automatically load single sheets – and I think that's unique for this sort of printer.

You know, if I keep my paper round going for a few more weeks I'll soon have enough to buy my own LC-10.

And then for a small fee, dad can borrow mine.



THE star COMPUTER PRINTERS

Star Micronics U.K. Ltd.
Craven House, 40 Uxbridge Road,
Ealing, London W5 2BS.
Telephone: 01-840 1800.

A division of
Star Micronics Co., Ltd., Japan.

Please send me details of the Star LC-10 business printers.

Name ____________

Company ____________

Address ____________

____________

Postcode ____________ Telephone ____________

Or just call Belinda on 01-840 1829. L 10 YC 12

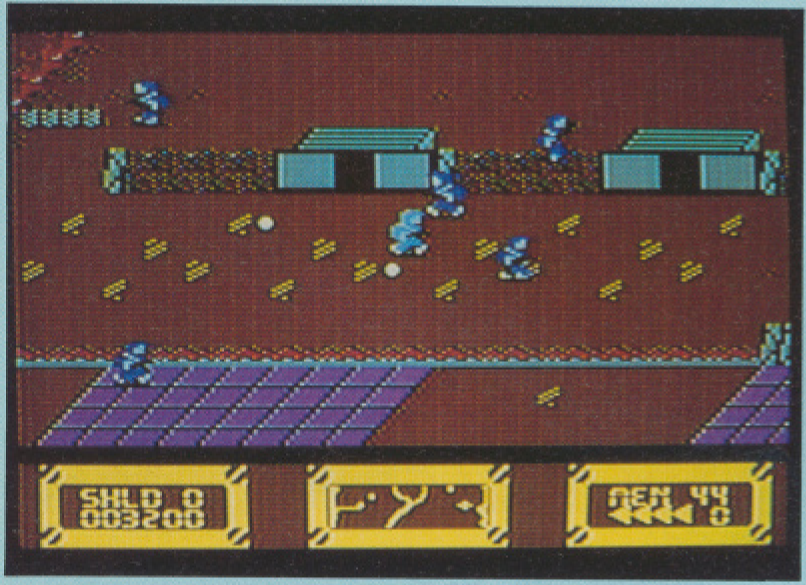
# BATTLE ISLAND

*Novagen have squeezed a quart into a pint pot – but does it taste as sweet?*

Novagen don't do that many games as you may well be aware. Their first big hit was Encounter which fast became the definitive Battlezone clone. This was followed up by Mercenary which really showd what could be done in 64K.

Now comes Battle Island which departs from their usual style of game in as much as we have a more conventional birds-eye view, Commando style game with maze and adventure elements thrown in for good measure.

Sounds a bit run of the mill? Well yes and no. The scenario is certainly nothing new but the fact that there are 350 screens worth of scrolling action all of which is memory resident, thanks to a rather nifty data compaction system conceived by Paul Woakes and programmed in by Gary Walton. Still, enough background, let's take a look at what Battle Island has to offer.



## The Mission

The scene is set on a mid-Pacific Island where, presumably, some whacko scientist has built and stashed a Neutron Beam (gasp!) which will no doubt be used to get freelance cheques out of publishing houses quicker.

As is customary, vast teams of crack troops have been sent ahead of you but none of them made it back (of course) so lucky old you has been picked to save the day. So it's off in your little rubber dinghy onto Battle Island (daan-daan-dahh!).

All you get in the way of equipment is a gun and a map showing the general outline of the island and the small enclave in the centre which is where the beam is stored. It's up to you to get round the maze-like island, find all eight pieces of a bridge which will allow you to cross the moat so that you can destroy this nasty weapon and make the world a safe place once more (!). Oh, and the other thing I forgot to mention was that there are also hostages on the island which need rescuing. All in all, you've got your work cut out for you.

Where does one begin on such a monumental adventure. Well, a good start is to have a close look at the map. This will give you a rough idea of scale and help you to avoid a few of the dead-ends caused by barbed wire fences, walls etc. Once you get the general feel for the terrrain that lies ahead, you can start to play.

The game uses a single joystick which functions in the usual manner, the space bar fires off any smart bombs you may have accumulated and holding down the fire button activates any shields you've collected.

The backgrounds have a *Zaxxon* feel because of the way the perspective is depicted. The foreground characters are simple but adequate in depicting you, enemy troops and the various objects that you can pick up on the way. Most of these objects have distinct uses and one in particular is essential if you are to complete the mission.

Extra firepower is earned by shooting baddies. Once half a dozen or so are shot, one of the corpses turns into a star which, when picked up, increases your armament by a factor of one. Once three of these have been picked up you can have three bullets flying across the screen at the same time. Once a fourth star is earned you are equipped with a shield which, as you may expect, is jolly useful in panic situations.

As for game play, I can safely say that it's one of those games that will infuriate you enough to keep going, without being so difficult that you just want to throw the joystick, the 64 and your mum out of the window.

Death is not terminal in this game because you can start from the last electronic gate you went through in the next, and all future, games during that particular session. It's a shame you can't save and load positions into the game, as I can see a lot of players getting very peeved if their goal is almost in sight and they have to end the session for the day and go back to the start. I guess that's all part of a graphic adventure's appeal.

The disk version could also have had a high score table that saved itself to disk (as could so many games – come on guys it only takes a couple of blocks).

Audio effects are a bit naff too. The sound of you losing one of your energy units is the sort of thing you hear when a contestant on a game show gets a question right. Mind you, the music is quite good so I shouldn't really complain too much, should I?

All in all, Battle Island is an enjoyable game but not really the sort of thing we've come to expect from Novagen, though it does make a change from all the mindless shoot-em-ups and it's good to see one that actually requires a little thought.

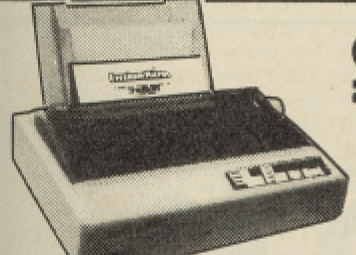
**Kevin Crosby**

***Touchline:***
***Title:*** Battle Island ***Supplier:*** Novagen, 142 Alcester Road, Birmingham, B13 8HS. ***Tel:*** 021-449 9516 ***Machine:*** C64/128. ***Price:*** £9.95 (cass) £14.95 (disk).

# Evesham Micros

**All prices include VAT/delivery**

## star LC-10
## Best-selling CBM ready printer



Now the established market leader in this price category, the LC-10 incorporates many advanced features for such a low price. Its facilities, not normally available in this price range, include 4 NLQ fonts (with 96 combinations) and paper parking (use single sheets without removing tractor paper). Good value 7-colour version also available, which will also accept standard LC10 black ribbons. LC10 available either in '64/128 ready form or as parallel version for Amiga users. Please state your computer type when ordering.

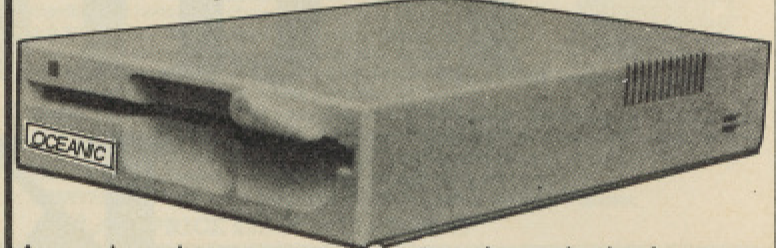
**Only £219.00**

**Colour version also available,**

**Only £269.00**

**Prices include two extra black ribbons free of charge**

## OCEANIC OC-118
### Previously sold as 'Excelerator Plus'




A superb package representing extremely good value for money, combining the Oceanic OC-118 disk drive (previously sold as 'Excelerator+') and the sophisticated GEOS system. Said by COMPUTE's Gazette to have "dramatic improvements over the 1541 in quality and reliability", the drive is a stylish and attractive compact unit featuring a direct drive motor and its own external power supply. GEOS brings the power of a graphic interface and integrated disk turbo to your '64 and includes geoPAINT, a graphic workshop, geoWRITE, a WYSIWIG word processor and many Desk Accessories. Many more extensions available - see below.

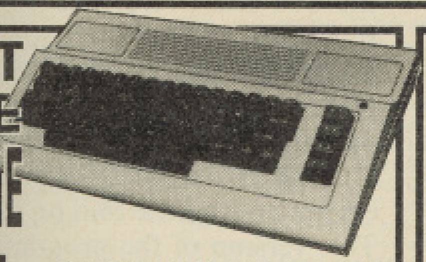
**Oceanic OC-118 & GEOS ..... £129.95**

**Oceanic OC-118 & GEOS plus *Freeze Machine* ............ £149.95**

## GEOS Applications

| | | | |
|---|---|---|---|
| GEOS 64 | £24.95 | GEOPUBLISH | £32.95 |
| GEOFILE | £24.95 | GEOPROGRAMMER | £32.95 |
| GEOCALC | £24.95 | GEOS 128 | £32.95 |
| DESKPACK+ 64/128 | £21.95 | GEOWRITE WORKSHOP 128 | £32.95 |
| GEOWRITE WORKSHOP | £24.95 | | |
| FONTPACK+ 64/128 | £16.95 | GEOCALC 128 | £32.95 |
| GEOSPELL | £16.95 | GEOFILE 128 | £32.95 |

## GET THE SLIMLINE '64



**Only £19.95**

***Your '64 could look like this!*** Why put up with an old fashioned looking computer? Fit this smart and modern looking new case to your '64 - it will look and feel like you are using a brand new computer. This high quality injection moulded case is simple to fit and gives a lower keyboard height. Reject the old image and order one *now.*

## FREEZE MACHINE for speed, power and ease of use

- Unstoppable Freeze
- Fast save routines
- Ultra-efficient file compactor
- Lazer and Turbo fastloads
- Integral reset button
- Tape turbo facilities
- 12 second disk format
- Selective file copier
- Selectaload
- many more useful features!

**Only £28.95**

For speed, power and ease of use it has to be Freeze Machine, probably the most effective backup cartridge on the market! Incorporating two types of fast load routines you can SAVE and reLOAD your favourite games in as little as 10 seconds and no more than 18. Numerous invaluable facilities available, including a built-in reset button. Utility Disc V3.0 also available to complement usage of the cartridge. It allows complete transfer to disk of many tape-based programs that load extra parts, eg. Gunship, Last Ninja, World Games, Supercycle. A very useful add-on.

**Utility disc only .......... £7.95**




## *Selected Products*

**DOUBLER '64** ...... Makes perfect tape backups every time. Consists of hardware and software. Requires access to two data recorders. Very easy to use, only .......... **£12.95**

**ICONTROLLER** ...... Natty little keyboard mounted cursor controller, ideal for icon-driven applications like GEOS .......... **£11.95**

**DATA RECORDER** ...... CBM compatible, same as C2N/1531 but cheaper and includes pause control button .......... **£24.95**

**DOLPHIN DOS** ...... Parallel operating system for use with 64/128 and 1541 disk drive. Fantastic speed increase on LOAD and SAVE whilst maintaining CBM disk format. Many extra DOS & BASIC commands, includes built-in monitor and Centronics printer driver ..... **£69.95**

**DISC DISECTOR V5.0** ...... Disk backup/utility package, very powerful .......... **£19.95**

**1541 PHYSICAL EXAM** ...... Consists of digital alignment disk and drive fault diagnosis software to check and correct 1541 head alignment. Includes quiet drive stops .......... **£39.95**

**1541 QUIET DRIVE STOPS** ...... Silences 'knocking' noise with 1541 drives .......... **£4.95**

**AZIMATE 3000 KIT** ...... Kit to check and adjust data recorder head alignment .......... **£6.95**

## AMIGA 500

### SPECIAL OFFER AMIGA PACK

Contains Amiga 500, TV modulator, Mouse, Joystick, Mouse Mat, 5 disks of public domain software, Deluxe Paint and 7 top games ('Karate Kid II', 'Sky Fighter', 'Grid Star', 'Demolition', 'Quiz Am', 'Black Shadow' & 'Las Vegas'). Total retail value of extras supplied is £270.45.

**All this for only .......... £399.00**

**Philips CM8833** (Colour monitor suitable for Amiga 500) .......... **£259.00**

**Philips CM8852** monitor as above, but higher resolution .......... **£299.00**

**Cumana external 5.25" floppy drive** 40/80 track 'Transformer' compatible . **£159.95**

## Disks & Boxes

**25 bulk packed 5.25" DS/DD disks** with sleeves, write protect tabs and labels. Good quality and fully guaranteed, only .......... **£13.95**

**25 disks + box.** Disks as above plus 50 capacity lockable storage box, only .......... **£22.95**

**25 disks + 100 box.** As previous offer but with 100 capacity locking box .......... **£24.95**

**50 capacity box.** Lockable storage unit for 5.25" disks with smoked perspex top .......... **£10.95**

**100 capacity box.** Larger version .......... **£13.95**

## How to order from Evesham Micros

**Phone us with your ACCESS or VISA card details on : ☎ 0386-765500**

All prices include VAT and delivery. Next day delivery £5.00 extra.

*Send cheque, Postal Order or ACCESS/VISA card details*

Govt., educ. & PLC orders welcome
Same day despatch whenever possible
All goods subject to availability, E.&O.E.
Open to callers 6 days, 9.30-5.30

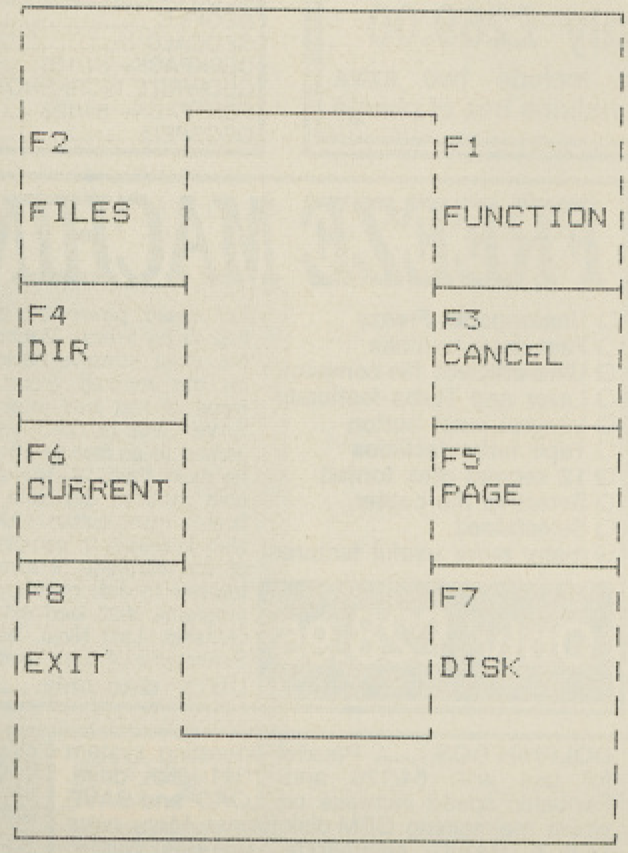

**Evesham Micros Ltd**
63 BRIDGE STREET
EVESHAM
WORCS WR11 4SF
✆ 0386-765500
fax 0386-765354
telex 333294

*Also at: 1762 Pershore Rd., Cotteridge, Birmingham B30 3BH Tel: 021 458 4564*

# Function Key Labeller

*Looking through pages and pages of an instruction manual to find out which function key does what is a thing of a past.*

***By Colin Howard***




***A printed label***

The wonderful designers of the C64 blessed it with some extremely handy function keys – four of them in fact. These function keys have been put to a variety of different uses: they've been used to bring up pop-up menus; activate disk functions or even activate that wonderful thing, the smart-bomb, in shoot-em-up games. The only problem is remembering which key does what.

Manufacturers of other computers with function keys obviously realised that this could be a problem and so catered for it. One shining example must be Acorn's BBC computer, this has a clear plastic strip above the function keys under which you can slip a strip of paper under telling you everything you need to know.

In the past *Your Commodore* has published a function key template for the C64 that overcomes this problem. It used the 1520 printer plotter to *draw* a template that could be cut out and placed around the function keys. The operations of each key clearly marked.

Unfortunately 1520 printer plotters are now a little thin on the ground. This version of the program uses any Commodore compatible printer to produce a clearly labeled template.

## Using the program

The program is presented here as a Basic listing. You should type it in using our *Syntax Checker* (see Listings) to minimise typing errors. Once the program is typed in and saved simply RUN it.

When the program is started a screen offering options to edit the information to be printed is presented to the user. It is important to note that not more than 7 letters can be entered for each function key.

Because every make or model of printer is slightly different you may have to play around with the print statements that produce the template to get the best layout for your setup.

ou every-
odore has
nplate for
problem.
er to draw
t out and
keys. The
y marked.
ter plott-
e ground.
uses any
rinter to
nplate.

here as a
type it in
ker (see
ng errors.
and saved

started a
edit the
presented
note that
be entered

model of
you may
the print
template
r setup.

# Double Height

*Enhance your text displays with an expanded character set.*

***By Clive Horner***

When you want to highlight something on your C64 monitor screen, the Commodore character set is somewhat lacking in impact.

The small program presented here changes the character set in such a way that a new double-height set is made available. Now important messages or game titles can be made to really stand out.

## Getting it in

The program is presented in the form of a Basic loader. Type this in using our Syntax Checker (see listings pages for more details). Once you have typed the program in save it to disk or tape BEFORE you run it.

The Basic Loader that you have just entered is designed to save the machine code for Double Height on your own disk or tape. Before you run the loader make sure that you have the disk or tape that you want the program saved to in the relevant device.

When you run the Basic loader, after a few seconds the prompt 'SAVE TO TAPE OR DISK' will appear. Choose the correct medium and the machine code will be saved. If you now check your disk directory or tape you will find that a new program DBL HEIGHT is present. This is the program that you should now use, the Basic loader can be forgotten about.

To produce double height characters you use a combination of SHIFT plus the letter that you require or the Commodore key and the letter you require. If you try this you will notice that *SHIFT + letter* produces the top half of the letter and *COMMODORE + letter* produces the bottom half of the character that you require.

You will, no doubt, realise that each line that you want to print in double height will have to be printed twice, once using SHIFT and then again a line lower using the Commodore key. To clarify this, let's say that you wished to print the letters ABC in double height. A program to do this would look like the following:

```
10 PRINT "(SHIFTED A)(SHIFTED B) (SHIFTED C)"
20 PRINT "(CBM A)(CBM B) (CBM C)"
```

It is possible to make the top and bottom of your characters a different colour by using:

POKE 646, new colour

before each PRINT line.

## Using the program

When you want to use the DOUBLE HEIGHT program you should do the following:

Load the program DBL HEIGHT using:

LOAD "DBL HEIGHT", 8,1 if using disk
or LOAD "DBL HEIGHT", 1,1 if using cassette.

When loaded type the following:
POKE52,48:POKE56,48
POKE 53272,29:CLR

The new double height character set is now ready for use.

to do this
g:

ED A)
C)"
B) (CBM

top and
a different

DOUBLE
uld do the

HEIGHT

3,1 if using

T", 1,1 if

wing:

aracter set




The storm has broken. MicroProse's latest title is here.

This high technology simulation of strategy and tactics is based on one of the most dramatic and detailed stories of modern warfare – Red Storm Rising, the international best-seller by Tom Clancy and his technical collaborator Larry Bond.

Working with the authors, MicroProse have brought the book's intense action and excitement to your computer screen. You are put in command of an American nuclear attack submarine at a time when the two super powers collide.

Standing between the Russian bear and global domination, you play a crucial role in the conflict. Missions take you to an astonishing variety of undersea environments, plunging you into challenging and exciting situations.

Prepare for action in this heart-pounding simulation. Available for Commodore 64/128 Cassette £14.95, Disk £19.95.

**MICRO PROSE**
SIMULATION • SOFTWARE

RED STORM RISING by Tom Clancy © 1986 by Jack Ryan Enterprises Ltd and Larry Bond.

Please send ______ Copies of Red Storm Rising C64 Cassette ______ Disk ______
Name (block capitals) ______ Address ______
______ Post Code ______
I enclose £ ______ including 55p P+P. Cheques payable to MicroProse Software Ltd. ______
or debit my Access/Visa card. Expiry date ______ No. ______

MicroProse Ltd., 2 Market Place, Tetbury, Gloucestershire GL8 8DA. UK. Tel: (0666) 54326. Tlx: 43422 MPS/UKG.

# Red Storm Rising

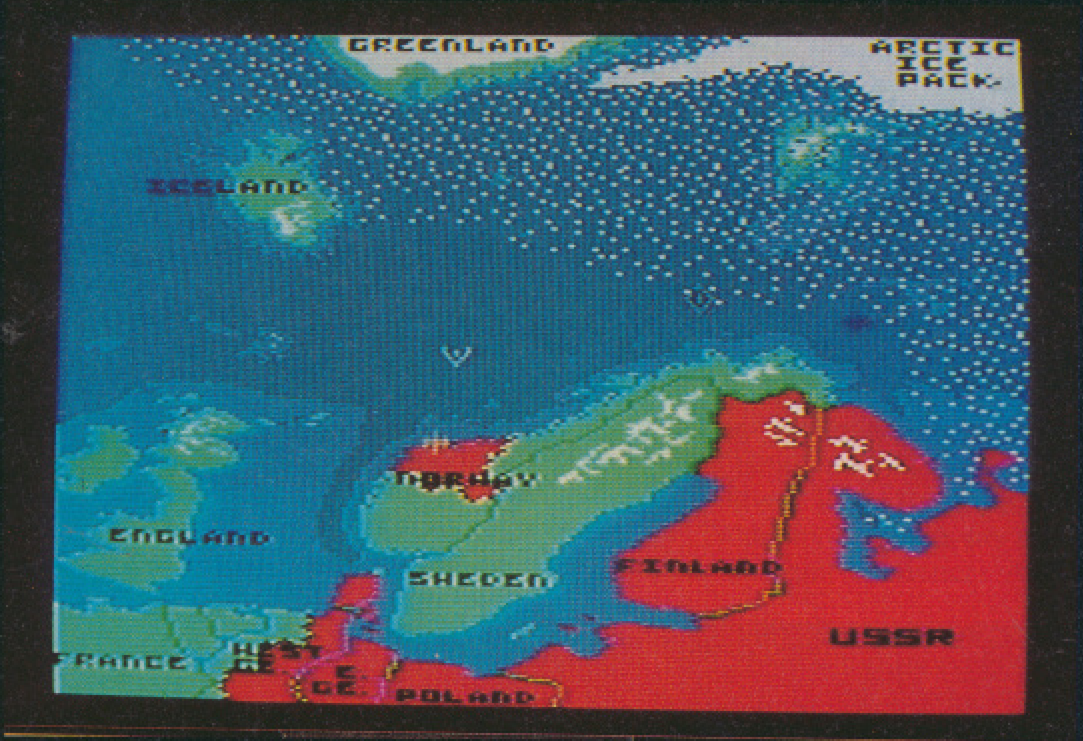
Based on the bestselling novel by Tom Clancy, Red Storm Rising casts you as a US submarine commander on patrol just as World War III breaks out. Unlike other simulations of the war that, hopefully, will never happen, this is a non-nuclear version and assumes that disarmament worked, which is just as well because a nuclear war would be decided in only a few minutes.

War has broken out because the Soviets mounted an invasion into the Middle East after Islamic nationalist terrorists had blown up their Siberian oil fields. As the Russians massed on the border a clash between East and West was inevitable.

Although you were at sea when the hostilities began, you quickly realise what has happened when the missions you are asked to carry out become tougher and more frequenct. As the game unfolds, you learn just how important your success of failure is to the outcome of the war.

Your craft is an American, nuclear-powered, attack submarine that's armed with MK48 torpedoes and Harpoon missiles (there are other subs available with slightly different weapons but the balance remains the same). The submarine is also fitted with the latest sonar and radar equipment and it is with these that you will stalk and attack your prey which varies between Soviet submarines wolfpacks, carrier task forces, or anti-submarine patrols with support fleets and landing craft.

You operate from your base at Holy Loch in the north of Scotland and into the Norwegian theatre of operations that stretches from the UK in the east to the Barents Sea in the west and from Iceland and the Arctic in the north down to mainland Europe. It is vital to the outcome of the war to cause as much damage as possible to the Soviet fleet as it tries to escape to the Mediterranean Sea and Atlantic Ocean. The more damage you do, the more seriously you will damage its war effort.




The Norwegian Theatre also contains a variety of conditions that will challenge all submarine commanders, as you may have to fight a battle in deep water, shallow water or even in among the ice-floes in the north and the east. This will make an already difficult, cat-and-mouse game almost impossible.

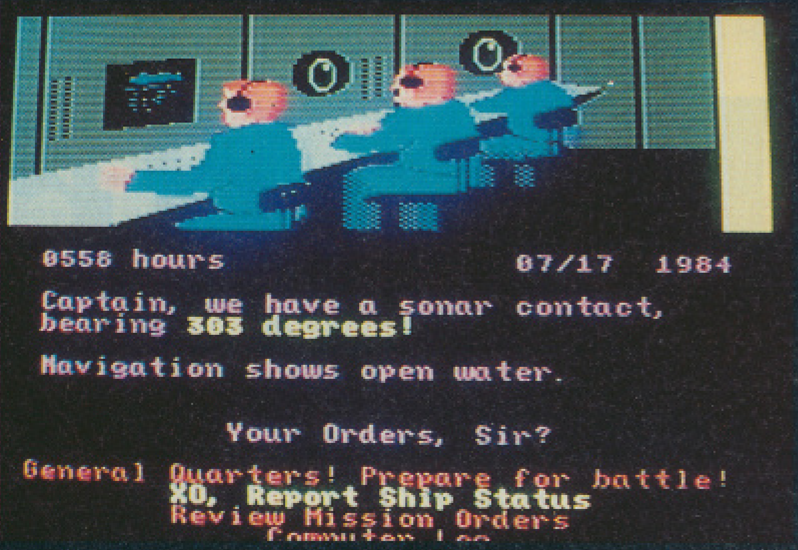
Although the game is written by Sid Meier, author of F-15 Strike Eagle and Silent Service (in collaboration with Tom Clancy and Larry Bond), it is as different from the World War II action of Silent Service as you could imagine, because the end-around, attack tactics of then just won't work now.

One reason for this is the incredible ranges of the weapons in modern naval warfare, another is the accuracy of today's sonar and radar. Learning to use this well will determine the difference between success and failure.

The main screen of the game is the sonar display which remains blank until a contact is made. Each new contact appears grey until your sonar operator is certain that there is something there. A numerical display also shows the contact's course and speed (when this data has been determined), its bearing and the percentage of certainty. If this rating is over 70 per cent then you're almost sure there is something there and the colour on the screen becomes lighter. Over 90 per cent you can identify the class of ship, its speed and course, and you can then prepare your attack.

You have three ways of finding the enemy: towed sonar, active sonar and radar. Towed or passive sonar uses a range of equipment that you tow behind the submarine and can be disrupted by sudden manoeuvres or




changes in speed. This is the safest method because you can detect the enemy without them finding you. Active sonar is more accurate but will also reveal your position and radar only works for aircraft detection. To make things more difficult, all devices are affected by the sea conditions, thermal ducts, and your depth and speed. If you go too fast when you're too shallow, then your propellers will cavitate in the water, drown out the sonar reception and announce your position to the enemy.

Once you've found your enemy, you must plan your attack. Obviously, you will devise your own tactics and may wish to approach on the blind side of the destroyers when attacking a convoy but I prefer, and have had some success with, more direct tactics. Once I've tracked the enemy with passive sonar for a while, I launch a barrage of MK48 torpedoes at the destroyers in the group, setting them so that they don't surface until the last minute and therefore remain undetected. A quick course change brings a different attack angle and, after a short delay to reload all four torpedo tubes with Harpoon missiles, a second assault is aimed at the destroyers. With a little practice, the results can be devastating, while you slope off to a new position, reload and wait to see what survives the Harpoon strike as it destroys, or at least damages, the support craft. The support ships or landing craft will then immediately bolt straight into the approaching, slower torpedoes.

Unfortunately, it doesn't always go exactly to plan and sometimes leaves you in a deadly, watery dogfight with a destroyer. You must avoid this long enough to allow you to reload with some of your limited supply of noise makers and decoys to distract any incoming missiles or torpedoes. Forget about the old tactics of hiding silently at the bottom, against today's sonar it just doesn't work.

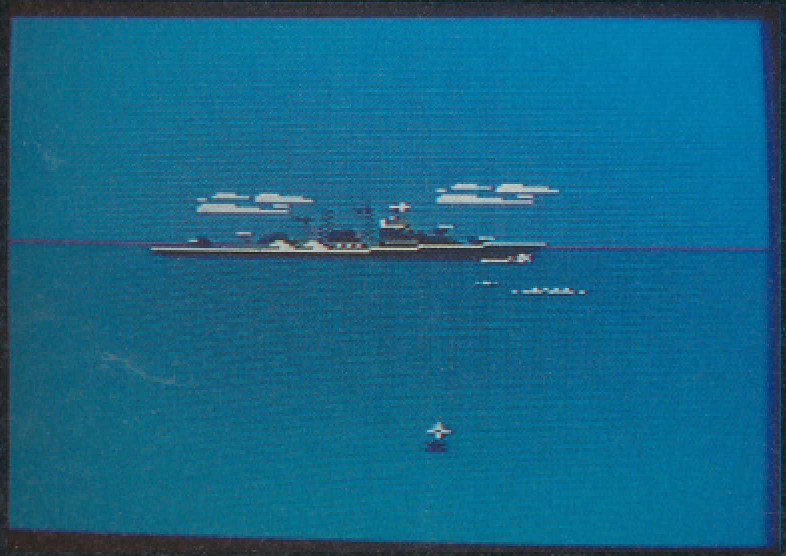
At the end of the battle, you'll receive a report that will either congratulate you on your success, tell you that some got away or report that you were picked up after your sub was destroyed. You are then given a new command according to the gravity of the situation.

Next, a summary of the latest events in the war is displayed either as news reports or intelligence files, determined by your success or failure. For example, if you didn't take out a landing force that was heading for Iceland, then this would turn red on the map showing that it has fallen.

This map is also used to control strategic movement and shows the reported positions of enemy surface and submarine groups. NATO spy satellites patrol overhead and plot the position of the enemy more accurately so you can close for attack. You can also use this screen when you need to return to Holy Loch for repairs or reloading and you can then collect any promotions or medals that you've been awarded.

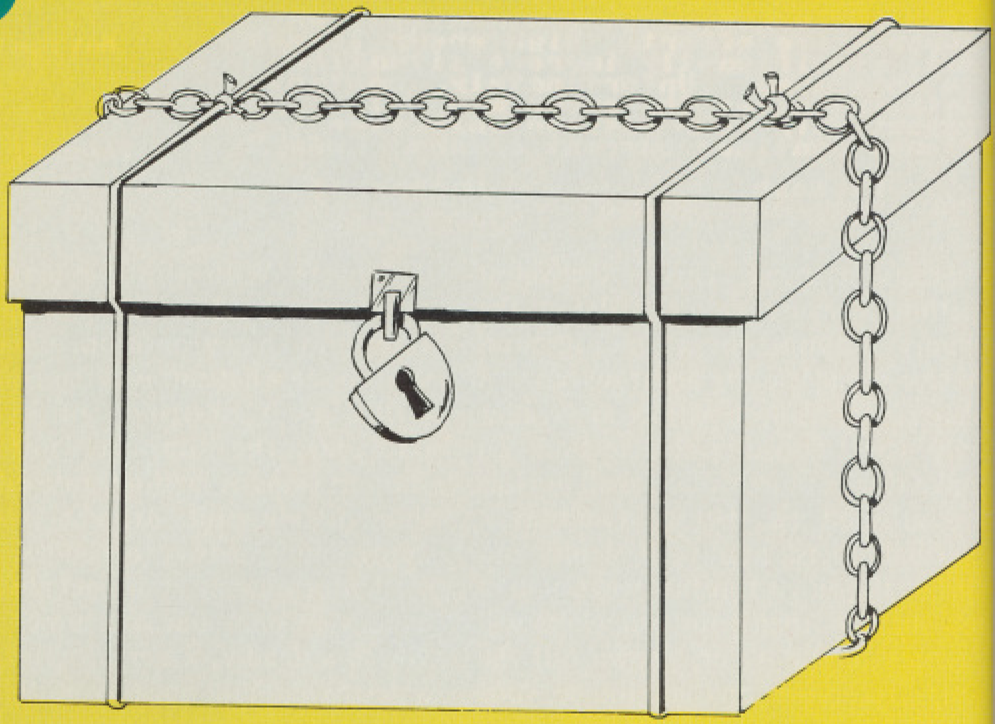
If you don't feel ready for an entire war, you can take on individual missions at a variety of skill levels. Although the game has a few graphics sequences, such as when a missile hits an enemy ship, it lacks the graphic appeal of games like Gunship. Still, a must for those who like their action tense and exciting.

***Touchline:***
***Title:*** *Red Storm Rising.* ***Supplier:*** *Microprose, 2 Market Place, Tetbury, Gloucs, GL8 8DA.* ***Tel:*** *(0666) 54326.* ***Machine:*** *C64/128.* ***Price:*** *£18.95.*





# Program Protection



*Preventing your latest masterpiece from being listed and copied can be quite a problem. We give you a few ideas on how to protect your work.*

**By F. Moane**

Keeping prying eyes from looking at your latest program can be quite a problem. This article is an attempt to give a comprehensive guide to most of the methods of protection. All these methods are to stop your friendly neighbourhood hacker from breaking into your program.

Unfortunately it is almost impossible to stop a person from actually copying your work with the range of cartridges and nibblers available today. Anyway, have fun poking round your Commdore.

## RUN STOP/RESTORE

### Commodore 64

RUN STOP + RUN STOP/ RESTORE
*Disable:* POKE 808,54:POKE 809,188
*Enable:* POKE 808,237:POKE
*Enable:* 809,246

RUN STOP + RUN STOP/ RESTORE + LIST
Disable: POKE 808,234
Enable: POKE 808,237

RUN STOP + INTERNAL CLOCK
*Disable:* POKE 788,52
*Enable:* POKE 788,49

RESTORE
*Disable:* POKE 792,193
*Enable:* POKE 792,71

### Commodore 128

RUN STOP + RUN STOP/ RESTORE
*Disable:* POKE 808,100
*Enable:* POKE 808,110

RUN STOP
*Disable:* POKE 808,112
*Enable:* POKE 808,110

RESTORE
*Disable:* POKE 792,100
*Enable:* POKE 792,62

## Disabling other keys

SHIFT
*Disable:* POKE 657,0
*Enable:* POKE 657,128

CBM/SHIFT
*Disable:* PRINT CHR$(8)
*Enable:* PRINT CHR$(9)

WHOLE KEYBOARD (for joystick input etc)
*Disable* POKE 659,0
*Enable* POKE 649,10

## Prevent Reset

There is a method to defeat a reset switch on the 64 or the built in switch on the 128. it simulates an autostart cartridge and is used only with a machine code routine, which is executed on a reset call.

Basic programmers could also use this method by pointing to a machine code routine which would run their program.

The locations are as follows:

**$8000-$8001** (32768-32769)

Start address of routine to jump to on reset in low byte/high byte format

**$8002-$8003** (32770-32771)

Address for the RESTORE key to jump to when pressed in low byte/high byte format

**$8004-$8008** (32772-32776)

Put the bytes **$C3, $C2, $CD, $38, $30,** (195, 194, 205, 56, 48) into these locations. Values are ASCII for CBM80, the cartridge identifier code.

Some games authors define the RESTORE key to restart the program and the RESET to point to a warning message, or even a small game!

## Preventing List

If, by accident, your Basic program halts with an error, it is easy for a hacker to list the program. POKE 808,234 does the job of scrambling LIST but the methods discussed here are tougher to disable.

**The simple methods:**

At the start of your program put a line with a REM statement followed by a SHIFTED L. The program will list with a SYNTAX ERROR.

This protection is easy to defeat, since not listing the line with the REM statement will reveal the rest of the program.

POKE 774,134:POKE 75,227

resets the computer once LIST is typed. If you use the reset protection, your program will restart. That should fool 'em!

**The more complicated methods:**

Load in your program and PRINT PEEK(2049). Note this down and then POKE 2049,255. The program cannot be listed but will RUN correctly.

This method has a drawback as if there is a GOTO or GOSUB in the program to a lower line number, Basic gets confused. Before such an action, POKE 2049 with the value that you previously noted and remember to put 225 in 2049 when the GOTO or GOSUB is finished.

Add the following lines to your program exactly as shown.

```
0SYS2063
1**********
```

Now, enter the following string of POKEs in direct mode, each seperately.

```
POKE2063,169: POKE 2064,26:
POKE 2065,133: POKE 2066,43:
POKE 2067,32: POKE 2068,89:
POKE 2069,166: POKE 2070,76:
POKE 2071,174: POKE 2072,167:
POKE 2059,0: POKE 2060,0
```

These POKEs are machine code to move the start of Basic to the start of your program. The last two POKEs set the end of program's 'two-nulls' to just after line 0. Feel free to disassemble the machine code.

The result of all this is a program that runs as normal, but lists as 0 SYS 2063

Practically impregnable!

## LIST Tricks!

LIST is a powerful command. A couple of one liners can modify it considerably.

POKE 774,0

This has the strange effect of listing only the line numbers of a program! This POKE could be placed in a loader program to protect the subsequently loaded main program.

POKE 22,35

An instant wordprocessor! Using the Commodore's powerful screen editor, text can be manipulated, printed and saved without a program. The method is to type your text as a BASIC program with line numbers. when finished, enter the POKE and the line numbers magically dissapear!

## Autorun

Most Commodore owners will be familiar with the concept of chaining programs, ie, loading a second program from within the first. This has the advantage of automatically running the second program. Problems are sometimes encountered if the second program is longer than the first.

Using this method, protection can be set up in a short loader program so that interrupting the load would be impossible.

```
10 POKE 808,234:REM RUN
STOP/RESTORE
20 POKE 774,0:REM LIST
PROTECT
30 PRINT CHR$(147);
"LOAD"+CHR$(34) + "PROGRAM
NAME"+ CHR$(34)+",8,1"
40
FORX=1T03:PRINTCHR$(17):
NEXT:
PRINT"RUN":REM LOAD AND
RUN PROGRAM
50 POKE 631,19:POKE632,
13:POKE633,13:POKE198,3
60 REM SET KEYBOARD
BUFFER WITH HOME AND 2
RETURNS AND QUEUE TO
THREE PRESSES
70 NEW:REM ERASES THE
LOADER AND LOADS THE
PROGRAM
```

I hope the REMs explain what the program does. This method is only useful if there is no printed material on the screen to be corrupted. Of course, the loader program itself can be listed. A *REM SHIFTED L* could cure this.

Programs are provided to illustrate two other methods of protection. The *INPUT BUFFER* program uses the input buffer to simulate a keyboard entry, without disrupting the screen.

The *AUTORUN* program is more sophisticated in that it uses machine code to alter your original program so that it always RUNs itself. Protection from RUN STOP/RESTORE is included and a message can be put on the screen.

To use this utility, have the *AUTORUN* program in memory and your Basic program on disk. When asked for a message, enter the text that you wish to be displayed before your program runs. Input the name of the old program, and a different name for the autostart version.

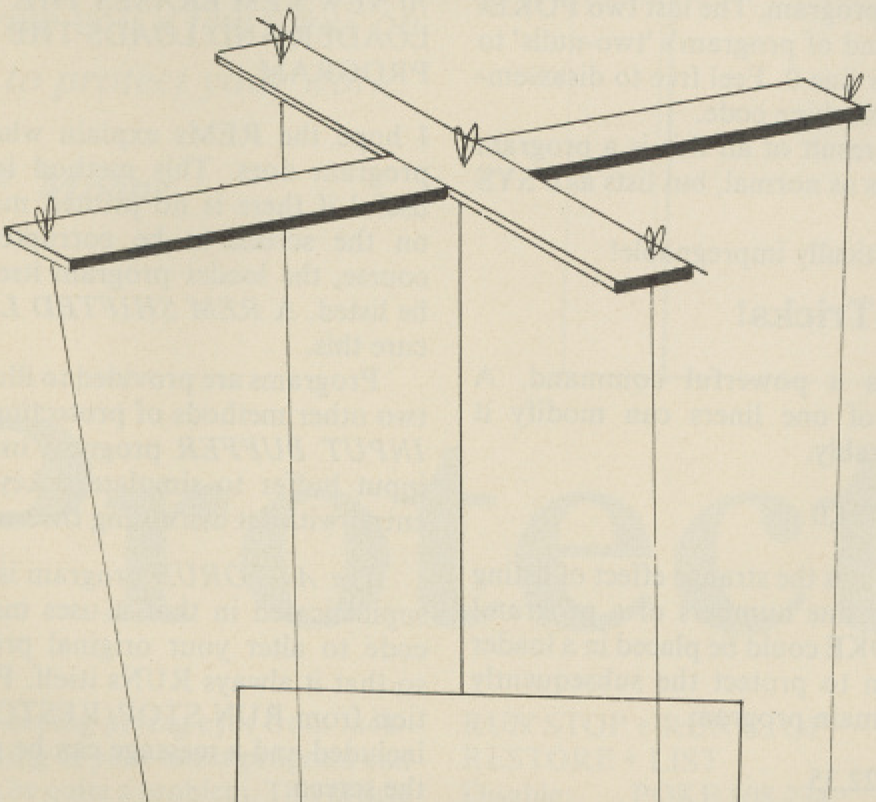
Obviously, the new program will take slightly more space on the disk. However, if you use the protection methods in this article, you will have a program which autostarts, defeats RESET switches, is impossible to stop, and restarts when LIST is typed!

You can't damage the computer with software, so experiment. I would warn you to keep backup copies, as some of the methods could result in the loss of the program. Remember to save your program with the protection before running, as there is usually no way to get out of it!

*Sprite manipulation for Basic programmers can sometimes be a real chore - but not any longer.*

***By Alan Obee***

# SPRITE



# CONTROLLER

You probably have a sprite designer such as *Your Commodore's* 3 in 1 Editor. With which you designed some aliens or fancy letters for a title screen that will never exist. One reason why this will never exist, may be because you don't know how to program the sprites to appear on the screen, or maybe you just can't be bothered to set up all those sprites, colours and X and Y co-ordinates exactly how you want them. Sprite Controller can solve both of these problems.

Sprite Controller allows you to place up to eight sprites on your C64 screen. Your sprites can be displayed in any way you wish; hi-res, multi-colour, X expanded, Y expanded, whatever is necessary. Then a stand-alone machine code program can be created and executed with a SYS call which will run the compiled file. All of this is done without the need to know or even understand machine code.

## Using the program

Type in SPRITE PROGRAMMER CODE and save it temporarily just in case anything goes wrong when you try to run it. If all goes well, running the program will result in a file called S.PROGRAMMER being saved to tape or disk.

Next, type NEW then enter and save SPRITE PROGRAMMER which is a normal Basic program.

The finished program is very easy to use. It can be used by an experienced programmer who doesn't wish to play around with the tedious task of manipulating sprites and trying to get the exact screen positions, or by a beginner because of the simple method in which data is entered.

The way in which a series of sprites is set up is by using switches – 1 for on and 0 off. To make it easier, let's go through the process of setting up two sprites.

First load Sprite Programmer and

run it. The machine code then loads in and the title screen appears. Pressing a key takes you to Page 1.

This screen has three boxes;
ENABLE X-EXPAND
Y-EXPAND.

These categories are all fairly self-explanatory.

To set up two sprites, let's use sprites 0 and 7 which must first be enabled, so press E for enable. A prompt will appear, at the top right of the screen, asking for 0-7. What it's asking for is the sprite we wish to enable, in this case we first want to enable sprite 0. Press 0, a 1 appears under sprite number 0 in the enable box. Repeat the process for sprite 7.

This operation works as a toggle, so to turn sprite 7 off, just repeat the process.

Once sprites 0 and 7 have been enabled you can expand them. I'll leave the X and Y expansion for you to play around with, it uses a similar method to enable.

Pressing F1 will take you to Page 2. The three boxes here are *Multi-colour, Use* and *Colour*. To make sprite 7 multicolour, press M and then 7. The box now tells us that sprite 7 is multicolour (set to 1), and the others are hi-res (set to 0).

The *Use* box shows which sprite is under control when placing sprites on the screen.

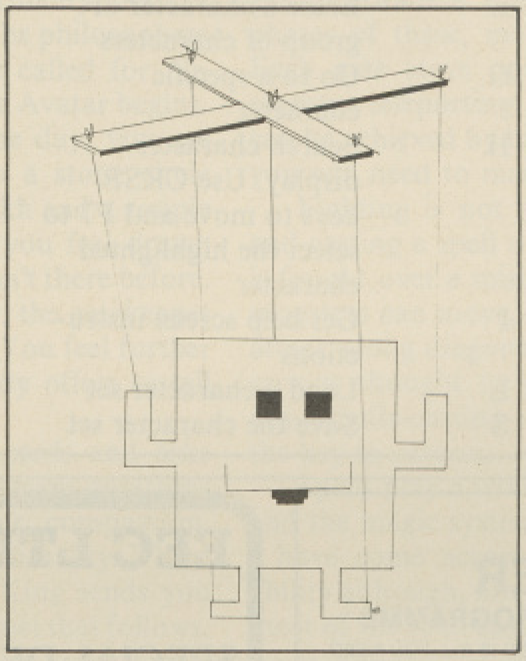
The *Colour* box works slightly differently to the others. Press C and the familiar prompt will appear: 0-7. To set sprite 0's colour to white, press 0 and another prompt will appear: 0-15. As you may have guessed, it's asking for one of the sixteen colours available to you on your C64. We want our sprite to be white, so look up the colour code for white in the manual and enter the value (which happens to be 1).

The colour box will now show a 1 under sprite 0, telling us it is set to white. Try and set sprite 7's colour.

Pressing F1 again will take you to the last page. Here you are presented with eight boxes. In boxes 0 and 7 there should be sprites of some description because these were the ones we enabled, but not necessarily the ones you want!

Beneath the boxes are some numbers, these are the sprites' data pointers. When you designed your sprites, they were placed in a certain part of memory and these data pointers can be used to tell the computer where, in memory, to get your sprites.

Sprite Controller allows you to use blocks 160-255 ($A0-$FF hex). If you use the 3 in 1 Editor, the blocks are shown at the corner of the grid. Let's say you have designed your two sprites in blocks $A1 and $A3, first convert this to decimal, so $A1 is 161 (10 x 16 + 1) and $A3 becomes 163 in decimal. Now we have to give the program these new values, so press B and enter the sprite number you wish to alter, for sprite 0 this is key 0. A prompt will then appear ready for you to enter your new value, key in 161. We have now given sprite 0 its new data pointer of 161. Now change sprite 7's data pointer to 163.



## Placing sprites on screen

We are now ready to place the two sprites on the screen. Remember on Page 2 the *Use* command? At present it should be 0, meaning that will be positioning sprite 0 on the screen. Usually you would have to switch between Pages 2 and 3 when *Using* and *Placing* sprites but it is possible to use the *Use* command on Page 3 even though it's not shown.

After you have selected the sprite you wish to use press P on Page 3. The screen will clear and display all the sprites that are enabled, but you can only move the sprite that you have selected. The cursor keys will move your sprite around the screen. When you are happy with it's position, press RETURN.

Before entering this screen, the screen colours are stored so you may change the colours without altering the editor colours. Note that the colours on the position screen will appear on the compiled program.

## Extra options

Pressing F7 will take you into a menu of other options, which may be called up from any of the three pages. You should understand most of the commands but one or two need to be clarified.

When you use the Save Variables option, you are only saving the data you have entered up to date and it can be reloaded to be completed later. Be careful when loading sprites in because blocks lower than position 160 will result in the sprite programmer being over-written.

## Creating the code

After you have entered in all of the data and placed the sprites in their correct positions, you are then ready to compile your program. I recommend that you save your data first because the compiled file cannot be edited. On Page 3, press C and enter the decimal value for the start address. In other words, where in memory you wish your code to be produced. The default location is 49152 ($C000).

When compilation has finished the start and end address are displayed. If you wish to have more than one compiled program in memory at a time, then I advise you to jot down the end address of each part so you know where to enter the new code after the previous one.

You will now be asked for a device number (RETURN = disk) and a filename for your code to be saved under. A SYS number will be given after you have saved your code, make a note of it.

When you load your created file, the SYS number can be used in your program to activate the routine. Machine code programmers can convert the SYS number into hex and use a JSR or JMP command, e.g. JSR $C000 or JMP $C000.

## Better late than never

I made a late addition to the program so it is now possible to display a background screen to help when placing your sprites. By pressing F8, a screen can be loaded at location 32768 ($8000). I thought this useful for situations when sprite positioning needs pixel accuracy, such as for start positions in games.

Have fun.

# Graphic Editor

*makes short work of designing small graphic blocks of characters*

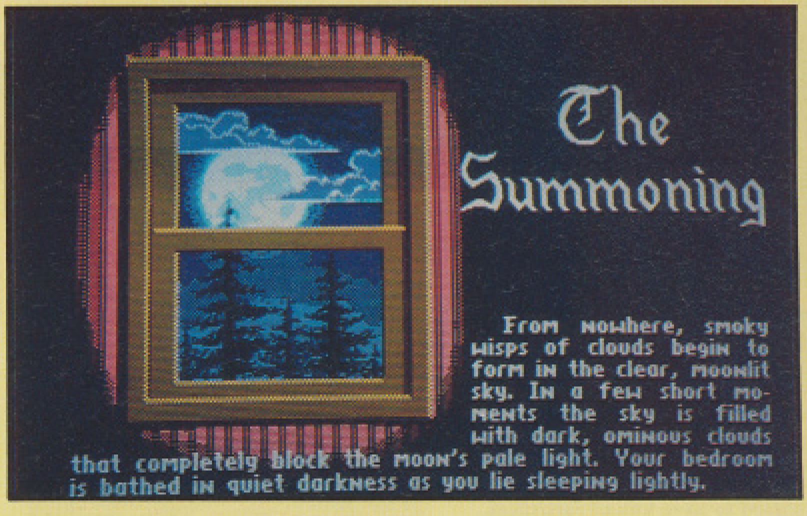
A large character editor is frequently more of a nuisance than a help, especially when a new alphabet or a small graphic block is the only requirement. This graphic editor can cope quite happily and then it will save the data as a data block for immediate loading, or as a Basic program that is ready to be poked into memory.

The program copies the character ROM into the area from $8800 to $9000 (34816 to 36864). As a RAM image they can then be individually altered using the range of 20 commands. The editor does more than this, up to 120 characters can be arranged in a 15x8 block for creating larger graphics on screen.

**Commands**

| | |
|---|---|
| B | Copy upper or lower case characters from ROM |
| C | Copy one character to another position in the text |
| D | Store character set on tape or cassette as Basic DATA |
| E | Erase a character or group of characters |
| G | Go to a specific character |
| H | Search character display. Use CRSR keys to move and F7 to select the highlighted character |
| I | Get help screen instructions |
| L | Load a character set |
| S | Save the character set |
| M | Multicolour toggle |
| P | Scroll a character to North, South, East or West |
| R | Rotate current character through 360 degrees in 90 degree jumps. |
| W | Select right or left window for action |
| + | Next character |
| – | Previous character |
| CRSR | Move cursor around editing screens |
| DEL | Erase last pixel to left of cursor |
| SPACE | Erase highlighted pixel |
| F7 | Turn pixel on |
| CTRL/RVS | Reverse pixel states |
| RUN/STOP | Abort current command |
| X | Exit |

# ULTIMA IV




At last! The Amiga version of one of the classic role-playing games has been released by Origin Systems. Although the fourth game in the series, Ultima IV is a quantum leap forward from its three predecessors.

Once the destruction of Exodus had been completed, as told in Ultima III, there were many upheavals, both geographic and political. New mountains rose whilst others sank without trace. A large continent fused together and it was upon this land mass, Britannia, that Lord British managed to bring some semblance of normality. As the Dark Age moves towards a new Light Age, the philosophers decide that a new set of moral values are called for. So it is that the quest for the Eight Virtues of the Avatar begins.

While taking a walk in the country one day, you are surprised to see a strange light appear in a stone circle near by. Further investigation reveals an ankh and a couple of books. As you continue your journey, you feel drawn to a mediaeval fair that you could swear wasn't there before. Instead of demanding your entrance money, the gatekeeper sees your ankh and welcomes you heartily. You feel further drawn to a gipsy caravan where an old lady offers to tell your fortune.

In front of you, she places a pair of cards and asks you to choose between them. The cards represent questions based on the eight virtues – honour, valour, compassion, honesty, humility, justice, sacrifice and spirituality. There are no correct answers. For example, the King sends you on a delicate diplomatic mission. In the banquet that follows, your country is terribly insulted. Do you bite your tongue in order to try and save the talks or do you stand up and defend your country to the best of your ability?

Once your career has been determined in this way, you are transported near to one of the eight cities of Britannia – each one specialising in one of the virtues and races of characters. At the start of the game, you are on your own. You will have to persuade seven other characters to join your party. Some will do so willingly, others will only join when you have reached a certain level of experience.

The initial quest involves building up your character so that he, or she, attains partial Avatarhood in each of the eight virtues. This is not as easy as it sounds because you will need to discover the appropriate shrine to meditate in, know the correct mantra and have found the appropriate stone. You must also have proved that you have reached sufficient proficiency in that virtue.

Information about various objects is gleaned by talking to everybody that you meet. Initial enquiries can be made as to a person's name, job or state of health. From the answers given, you get a clue to the next keyword about which to ask. Frequently you are cross-referred to someone else on the other side of the continent – ask at the Folley Tavern about Mandrake and you'll see what I mean.

This direct communication, although very limited does the give the game a definite, realistic edge over its rivals and is a start to introducing a system of non-player characters as found in traditional role playing games.

Transport is usually by foot but there are several other methods of moving about more quickly. Horses can prove useful but you are likely to make more use of the moon-gates. Britannia has two moons and, depending on the phases of these, moon gates appear at certain locations. Each gate stays open for three segments of time, each segment teleporting you to a separate location. Sea travel can be achieved by hijacking yourself a pirate ship although you will need to master the art of using the winds.

Fighting is not just a case of using the right weapon and casting a spell or two. Instead, every combat situation is fought over a mini playing area in which characters and monsters can move, as well as attack. As the monsters can attack along diagonals and you can't, you will need to give serious thought to your tactics. Making the best use of any missile-casting members of your party could well be the key to success.

Spells play a vital part in any fantasy role-playing game and the magic systems in Ultima IV is one of the best that I have come across. Several professions have a magical ability although, obviously, it is the mages who will be doing most of the spell casting. Characters have a number of spell points and can cast spells according to this ability. Providing, that is, that a suitable spell has been previously prepared.

Graphically, Ultima IV doesn't look anywhere near as pretty as its rivals, Bard's Tale for example, but, as they say, the play's the thing and here Ultima scores very heavily. The storyline is coherent and, what is more, credible. Nowhere will you find snakes with legs (Phantasie III) or monsters ninety feet away in a ten by ten room (Bard's Tale).

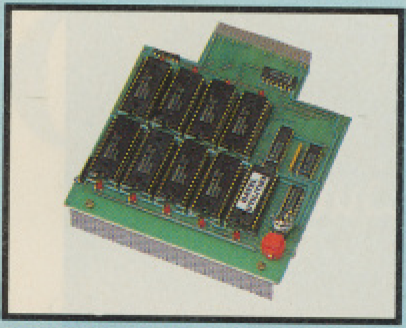
For anyone who has seen the C64 version of Ultima IV, the conversion will come as something of a slight disappointment. The two versions are more or less identical. Not surprisingly, the graphics are better on the sixteen – bit machine but not devastatingly so. One area where things could have been improved is in the system of command entry where use of the keyboard is still necessary. I felt that a series of pull-down menus could usefully have been implemented.

That apart though, Ultima IV is a superb game offering between one and two hundred hours playing time. You should just have time to get close to completing it before the long awaited Ultima V appears. Very highly recommended.

**Gordon Hamlett**

***Touchline:***
***Title:*** *Ultima IV.* ***Supplier:*** *Origin systems, Microprose, 2 Market Place, Tetbury, Glos GL8 8DA.* ***Tel:*** *(0666) 54326.*
***Machine:*** *Amiga.* ***Price:*** *£24.95*

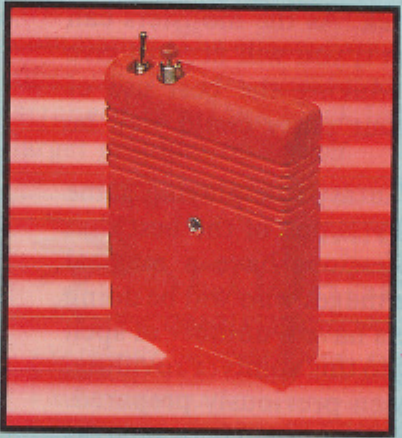
# DATEL ELECTRONICS



## 256K SUPEROM EXPANDER

- Select instantly from 8 sockets which accept up to 32K EPROM each.
- Program your own EPROMs using our EPROM programer.
- No need to have lots of cartridges - just make a selection from the Superom menu.
- Fully menu driven on power up.
- Select any slot under software controls.
- Unique EPROM generator feature will take your own programs - basic or m/c & turn them into autostart EPROMs. (EPROM burner required).
- Accepts 2764/27128/27256 EPROMs.
- On board unstoppable reset.
- On board operating systems - no programs to load.

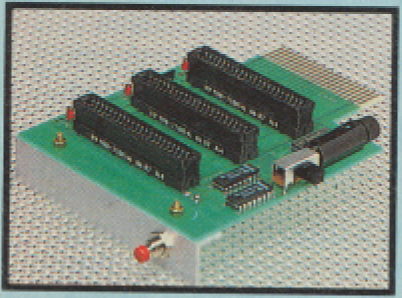
**ONLY £29.99**



## RESET CARTRIDGE

- Unstoppable reset button.
  NOTE:- user port cheaper type reset buttons offered by others are not unstoppable.
- Resets even so called "unstoppable" programs.
- Add pokes from magazines etc.
- Fits in cartridge port.
- Simply plug in.

**ONLY £5.99**

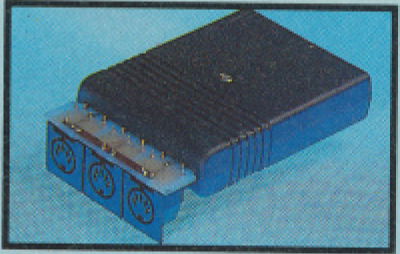


## 3 SLOT MOTHERBOARD

SAVE WEAR & TEAR ON YOUR EXPANSION PORT

- Accepts 3 cartridges.
- Switch in/out any slot.
- Onboard safety fuse.
- Fully buffered.
- High grade PCB.
- Reset button.

**ONLY £16.99**



## MIDI 64

FULL MIDI INTERFACE FOR THE 64/128 AT A REALISTIC PRICE.

- MIDI in/MIDI thru/2 x MIDI out.
- Compatible with most leading software packages.

**ONLY £29.99**



## DIGITAL SOUND SAMPLER

- The new sampler allows you to record any sound digitally into memory & then replay it with astounding effects.
- Playback forwards/backwards with echo/reverb/ring modulation.
- Now with full sound editing module to produce outstanding effects.
- Full 8 bit D to A & ADC conversion.
- MIDI compatible with suitable interface. (i.e. Datel unit for £29.99, see ad.).
- Live effects menu includes real time display of waveforms.
- Line in/mic in/line out/feedback controls.
- Powerfull sequencer with editing features.
- Load/save sample.
- Up to 8 samples in memory at one time.
- Tape or disk (please state).
- Complete software/hardware package.

**ONLY £49.99**

## COM-DRUM

DIGITAL DRUM SYSTEM

- Now you can turn your digital sound sampler into a digital drum system.
- 8 digital drum sounds in memory at one time.
- Complete with 3 drum kits.
- Real drum sounds - not synthesised.
- Create superb drum rhythms with real & step time.
- Full editing. Menu driven.
- Output to hi-fi or through TV speaker.
- Load/save facilities.

**ONLY £9.99**
STATE TAPE OR DISK

## COM-DRUM EDITOR

- 24 drum sounds supplied on disk to enable you to construct your own drum kit.
- Re-arrange sounds supplied with a Com-Drum to make new kits.
- Load/save facilities.

**ONLY £4.99** DISK ONLY

## DATA RECORDER

- Quality Commodore compatible data recorder.
- Pause control, counter, etc.
- Suitable for 64/128
- Send now for quick delivery.

**ONLY £24.99**



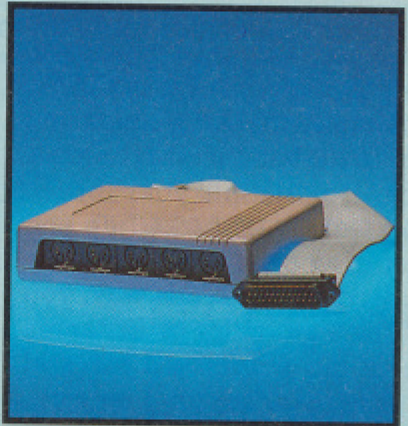

## DEEP SCAN BURST NIBBLER™

- The most powerfull disk nibbler available anywhere, at any price! Burst Nibbler is actually a two part system - a software package & a parallel cable to connect the 1541/1570/1571 to 64/128 (state type).
- What gives Burst Nibbler it's power? Conventional nibblers have to decode the data from the disk before it can transfer it using the serial bus - when non standard data is encountered they are beat. Burst Nibbler transfers data as raw GCR code via the parallel cable without the need to decode it so you get a perfect copy of the original.
- ● Will nibble up to 41 tracks ● Copy a whole disk in under 2 minutes ● Full instructions ● Regular updates - we always ship the latest ● Fitted in minutes - no soldering usually required ● Full or 1/2 tracks ● No need to buy parallel cable if you have Disk Demon/Dolphin etc. ● Cable has throughbus extension for other add ons.
- Wether to choose FastHack'em or Burst Nibbler? Fast Hack'em is unbeatable value as an "all rounder" - with nibblers, 1 or 2 drive copy, format, file copy, 1571 copy etc. etc., so if you have a more general requirement perhaps Fast Hack'em is for you. Burst Nibbler is a pure nibbler second to none, for the reasons stated. So if it's just making backups you are interested in, there is no other product to beat it!

**ONLY £24.99** COMPLETE

**SOFTWARE ONLY £12.99**

**CABLE ONLY £14.99**



## ROBOTEK 64

MODEL & ROBOT CONTROL MADE EASY.

- 4 output channels - each with onboard relay.
- 4 input channels - each fully buffered TTL level sensing.
- Analogue input with full 8 bit conversion.
- Voice input for voice control.
- Software features:- test mode/analogue measurement/voice activate/digital readout etc.

**ONLY £39.99**

INCLUDING HARDWARE/SOFTWARE MIC. ETC,(STATE TAPE OR DISK).

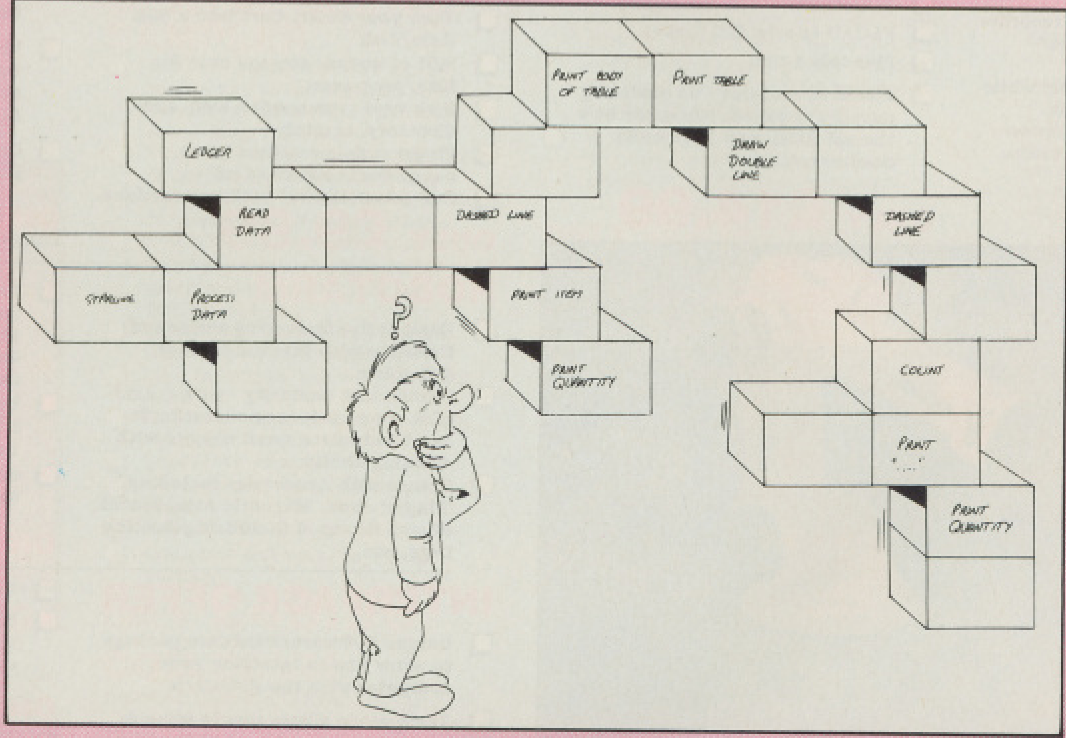
## TOOLKIT IV

THE ULTIMATE DISK TOOLKIT FOR THE 1540/1541

- A disk toolkit is an absolute must for the serious disk hacker. Toolkit IV has more features than most for less.
- DISC DOCTOR V2 - Read & write any track & sector including extra & renumbered tracks. Repair damaged sectors. Look underneath read errors.
- HEADER/GAP EDITOR - Decodes & displays ALL header information including off bytes & header gap. Rewrite the entire header & header gap. Renumber sectors. Also edit any sector tail gap.
- DISK LOOK - Sort directory. Recover lost files. Display file start /end addresses. Disassemble any file program directly from the disk to SCREEN or PRINTER including undocumented opcodes. Edit Bam.
- FILE COMPACTOR - Can compact machine programs by up to 50%. Save disk space. Compacted programs run as normal.
- FAST DISK COPY - Copy an entire disk in 2 minutes or less using single 1541.
- FAST FILE COPY - Selective file copy. Works at up to 6 times normal speed.
- FORMATTER - 10 second format an entire disk or format any individual track or half track 0 to 41. Re-define any of 30 parameters to create or recreate unique disk formats.
- ERROR EDIT - Quickly find & recreate all read errors including extras & renumbered tracks or sectors & half tracks from 0 to 41. Even recreates data under errors & allows you to redefine any necessary parameters.

**ONLY £9.99**

# STRUCTURED PROGRAM Design




*The follow-up article to improving the standard of your programs with structured programming*

**By Derek Barrett**

Following on from last time we'll continue to look at the third element — repetition.

Figure 7 shows the simple construction of a fixed loop. Box A leads us into the routine and serves as a comment. B shows that it is a repetition box and the figure 100 determines the number of times that the actions of C,D and E will be carried out. The variable name for the counter is usually written in the box.

What happens here is that actions C,D and E will be repeated, as a sequence, 100 times. This fragment of code should show the idea:

```
90 REM Process Number
100 FOR count = 1 TO 100
110 GET number
120 PRINT number
130 total = total + number
140 NEXT count
150 REM remainder of program
```

WHILE and REPEAT constructions are similar with the conditions included in the repetition box. (Figure 8).

This construction does not have a fixed number of repetitions so no number is included in the box. The controlling element in this case is that the variable TOTAL is less than 500. Hence the action will be carried out at least once and repeated until TOTAL exceeds 500. Those of you who do not have WHILE or REPEAT constructions in your language will have to re-arrange your code slightly to achieve the same result.

This is one occasion where GOTO will have to be used. Look at the following fragment of code:

```
90 REM Process Number
100 GET number
110 PRINT number
120 total = total + number
130 IF total < 500 THEN GOTO 100
140 REM Remainder of program
```

This will simulate a WHILE condition and as the GOTO only jumps a few lines the program is still readable. As you cannot show a jump in Top Down design you should draw your designs as Figure 8 so that it remains portable.

As I showed in the examples on selection, multiple conditions can also determine the repetition construction (Figure 9). Complex conditions can be shown alongside the box to avoid trying to cram too much into a small space.

## Reading Ahead

A common application of the top down technique is the reading of an undefined number of data items. Such a list usually has an 'End of File' (EOF) marker (often – 1 or – 999) which must be detected to terminate the loop. To design this you can use a WHILE loop with the condition 'NOT END OF FILE'. This means that we must already have read an item of data before entry and must read again as the last box before re-testing the condition. This is commonly known as the READ AHEAD technique. (Figure 10).

This construction is a common trap for the beginner. Make sure that you understand it and test it thoroughly.

Find out for yourself what would happen for the following:

a. B was omitted.
b. E and F were reversed.
c. After several numbers have been read in an EOF marker is read.
d. The first item read is an EOF marker.

## Procedures

When designing your latest masterpiece you will often find that the same part of the design crops up in several places. Why not group them together, as sub-routines or procedures, saving space in the final code and aiding legibility? In fact most professional programs consist almost entirely of procedures, with the main part of the program being simply a list of calls to the procedures. This greatly aids legibility and also allows easier modification of the final program. All you have to do is write a new procedure and call it when needed.

Unfortunately Commodore BASIC does not support PROCEDUREs but does have GOSUBs which, although not as versatile, can be used for a similar function.

Procedures are shown on top down designs by a horizontal dividing line a short way down the box. The procedure name is written in the box. When a procedure is called from the main design no further subordinate (lower) boxes are drawn from it. The procedure itself is shown on another sheet with the procedure box at the top. It may help in very large designs to show the page number of the procedure in the box as well.

Figure 11 shows an example. B calls the procedure DASHED-LINE which is on page 2 of the design. The result of running this will be to jump from B to the procedure, which draws a line of dashes across the page, then return to C, where 20 items and their quantities are printed. D calls DASHED-LINE twice, to put a double line of dashes across the page.

## Putting It On Paper

The designs you produce will use up

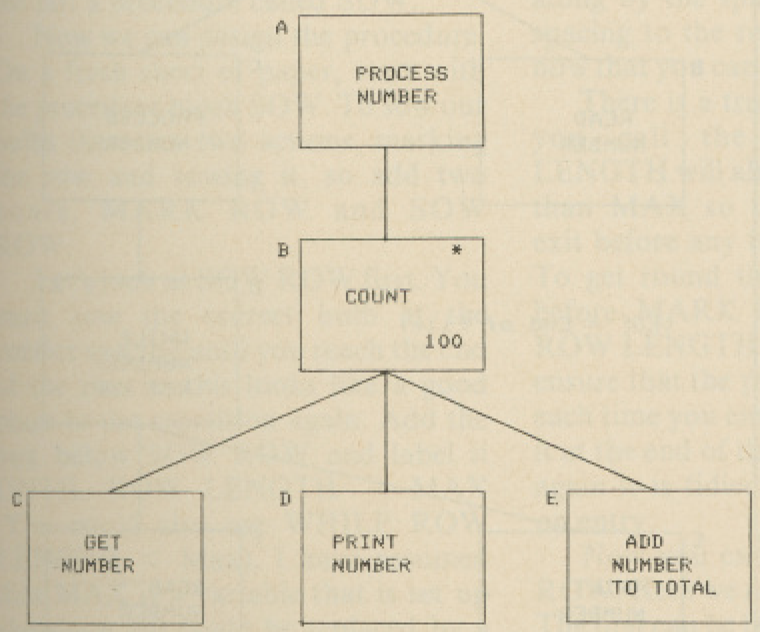



*Figure 7 – simple fixed loop*

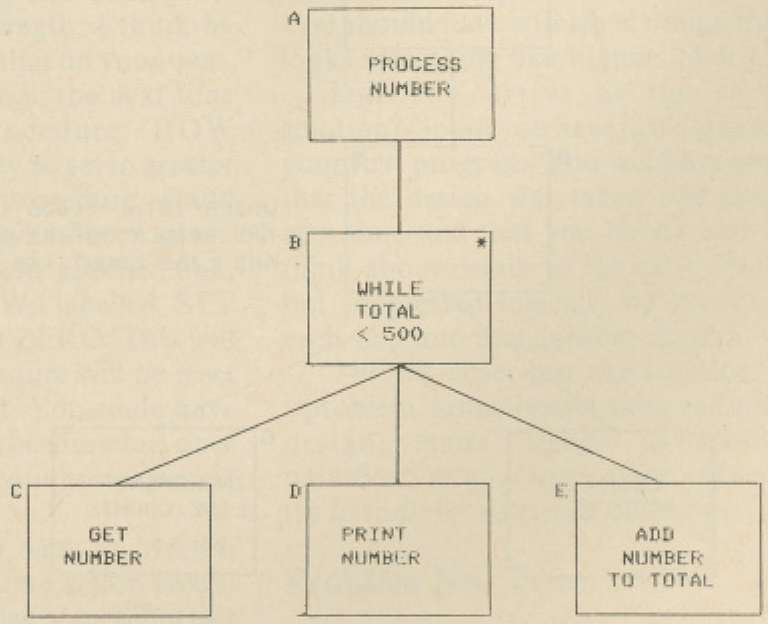



*Figure 8 – repetition using WHILE condition*

lots of paper. I tend to sketch mine out on A3 sheets before walking through them, modifying where needed, and then producing a final form, with a flowchart stencil, before I start to code them. Very often the designs grow so much that a single sheet of paper is not enough and some way of linking several sheets is needed. I will now introduce the only other symbol that you will need. It is a circle with the page number in it as shown in Figure 12. 12a shows a link to page 2 and 12b shows the opposite link from page 1. Such advanced ideas are taxing on the brain aren't they? What will I come up with next?

## Conventions

We have now covered all of the constructions that are needed for even the most complex of designs.

Before we go on to to look at some practical examples there are a few conventions to top down design that I will get out of the way. Most of these will be apparent from the designs and some have already been mentioned.

There can only ever be one path from an elementary box back to the top of the structure.

The design reads from left to right and from top to bottom.

Subordinates of a box must be:

a. all sequence boxes or
b. all selection boxes or
c. one repetition.

Only one path of a selection applies.

## Problem Solving

Now that you understand the constructions needed in Top Down Design we can have a look at a practical problem and go through its design.

The first example is, at first sight, very simple but will show the principle involved and also shows how Top Down Design can be applied to problems other than programming.

## Playing In The Garden

Imagine that you are a keen gardener and you want to plan your bulb sowing into orderly rows.

You have decided that each bed must be prepared, planted with bulbs and finally watered.

This is easy. Start by putting a single box at the top centre of the page and title it Process Garden. Then put a sequence of three boxes below, leaving a reasonable gap between each as we will expand downwards later. Label these boxes Prepare Bed, Plant Bed and Water Bed respectively.

You should now have something like Figure 13. That has solved the problem but let us expand it a little. Suppose now you decide that the bed should consist of:

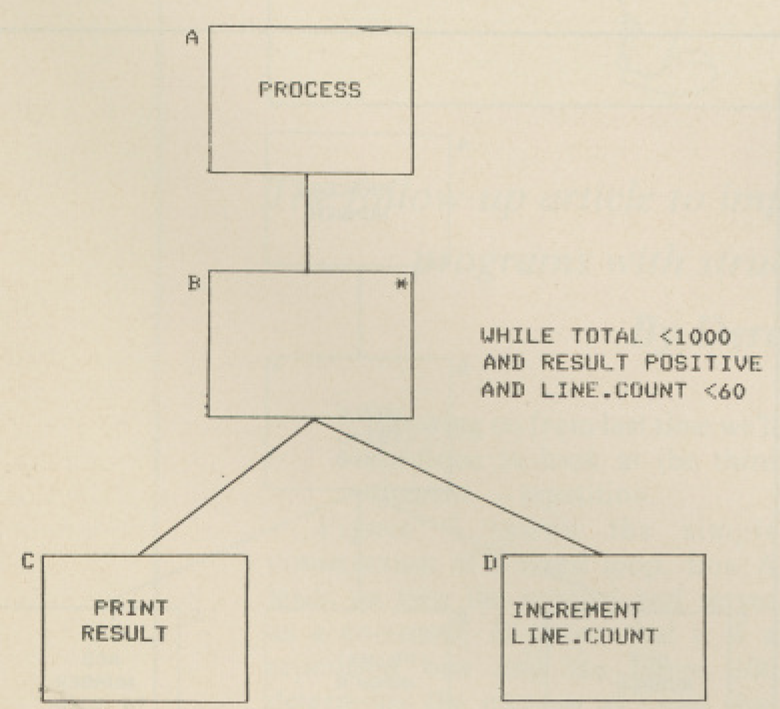
- One row of Begonias, spaced 25cm apart.
- One row of Gladioli, spaced 50cm apart.
- One row of Dahlias, spaced 20cm apart.

Here we must use repetition to determine the row. So add a repetition box below PLANT BED, label it ROW and indicate that it will be repeated 3 times. Now we must use selection to select the correct type of bulb. Add three selection boxes below the repetition box. Label these IF ROW =1,2 or 3 respectively.

As the action of planting the bulbs will be the same in each case we can use a procedure. But first we must set up the parameters that we will pass to it. That is, the type of bulb and its spacing.

Add three boxes below the first selection box. Label the first Bulb =

*Figure 9 – repetition with complex WHILE condition*



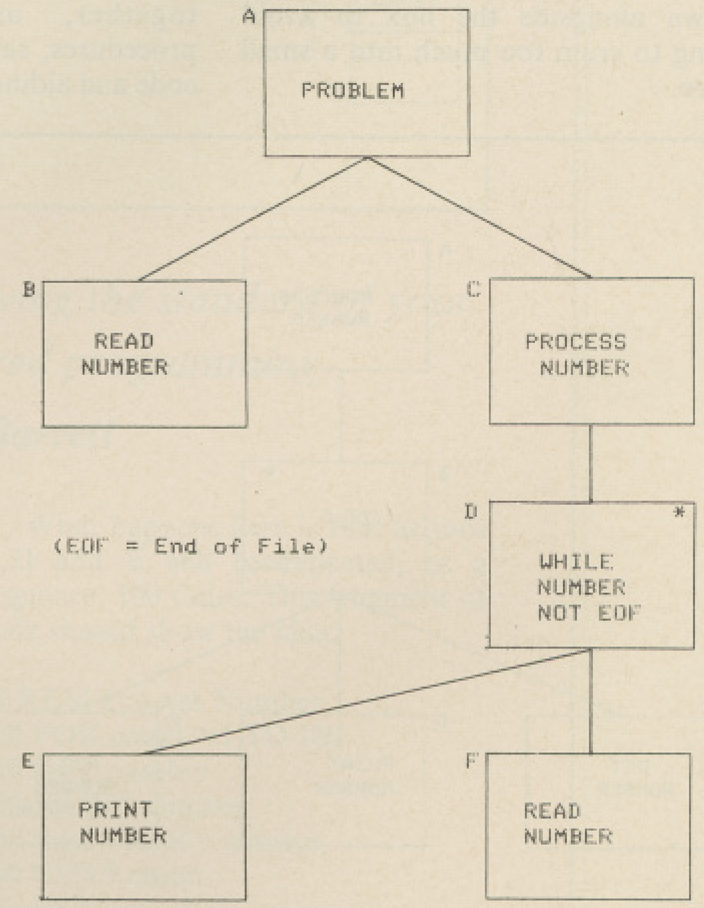
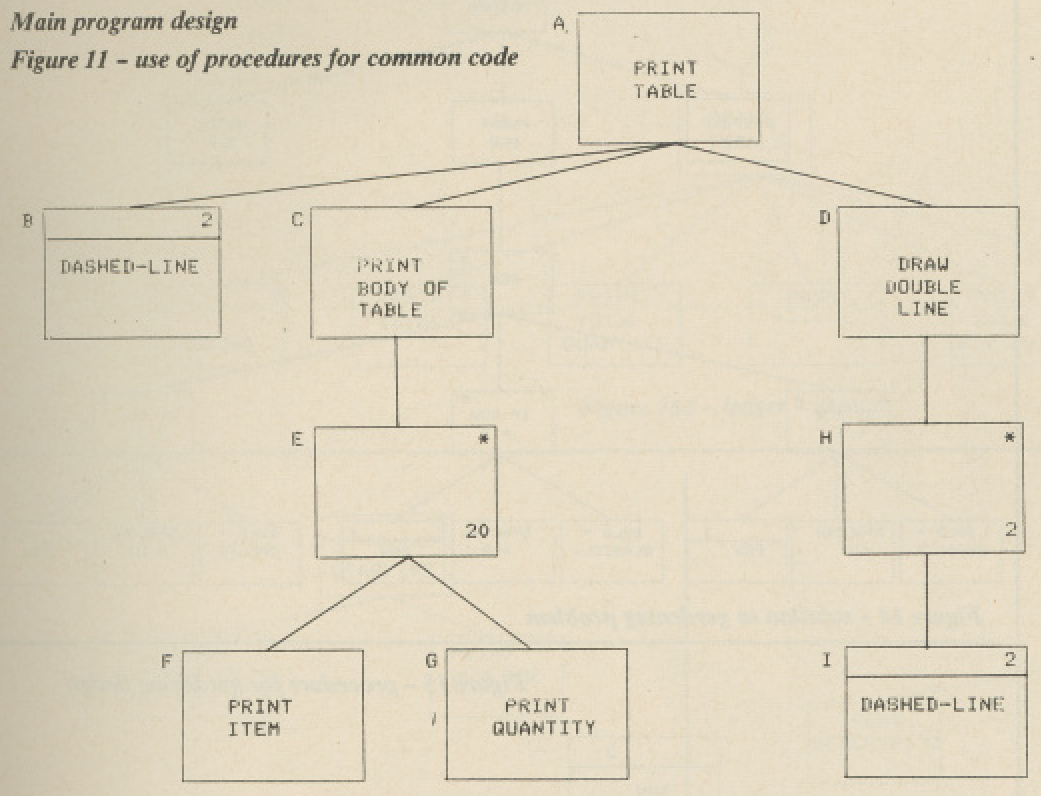
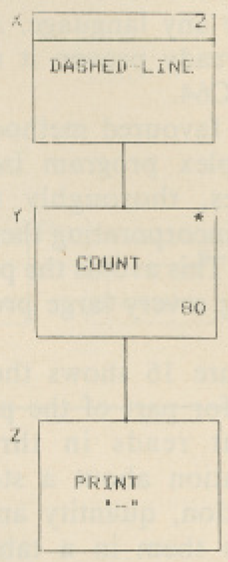




*Figure 10 – read ahead technique*

*Main program design*

*Figure 11 – use of procedures for common code*




*Procedures on page 2*

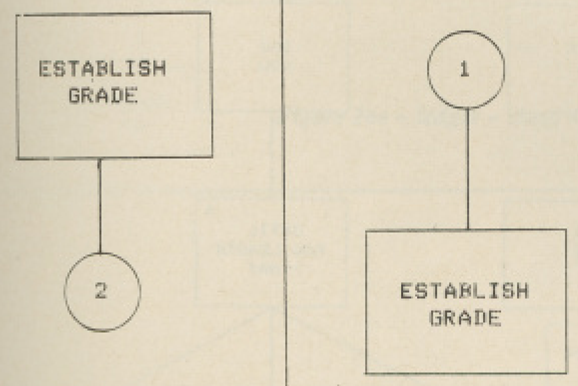



*Figure 12 – links between pages of design*

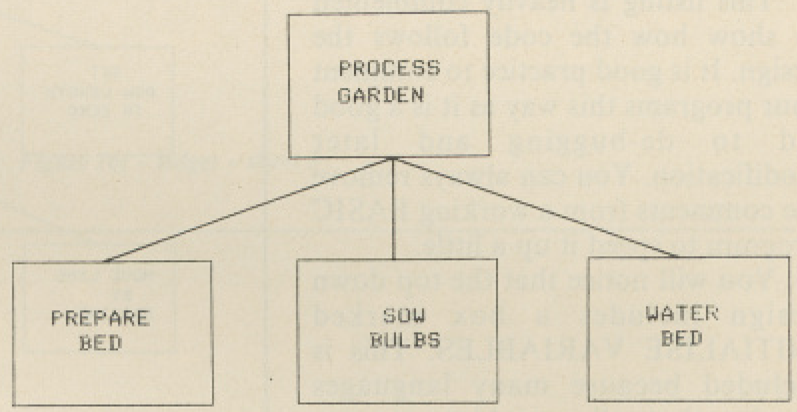



*Figure 13 – first step to design for sewing bulbs*

Begonia. The next Spacing = 25 and the last a procedure called SOW.

Now we can design the procedure. On a fresh sheet of paper, start with the procedure block SOW. To sow our bulbs there are two actions, marking the row and sowing it, so add two boxes, MARK ROW and SOW ROW.

Let's look at SOW ROW first. You must sow the correct bulb at the correct spacing until you reach the end of the row so this looks like a good place to use repetition again. Add the box below SOW ROW and label it UNTIL ROW LENGTH > MAX (You could also use WHILE ROW LENGTH < Max). I have assumed that MAX is a variable that is set up elsewhere but could be replaced by a figure if the row length is known.

The use of a variable allows for easier modification later if desired.

There are now three actions to sowing the row, sowing a bulb, moving along by the spacing and adding the spacing to the row length. I think by now that you can do that on your own.

There is a trap here, the next time you call the procedure ROW LENGTH will already be set to greater than MAX so the procedure would exit before any bulbs had been sown. To get round this add another box, before MARK ROW, labelled SET ROW LENGTH TO ZERO. This will ensure that the procedure will be reset each time you enter it. You could have it at the end of the procedure but once again it is tidier if conditions are set on entry.

Now you can go back to MARK ROW. Here we need two action boxes. The first can be labelled something like MOVE LINE BY SPACING and the second DRAW ROW.

Having now designed the procedure you can go back and finish off the design by filling in the detail for the remaining two selection boxes. You should have a finished design that looks something like Figures 14 & 15.

Did you arrive at the same solution? Good, you have just designed your first program. You will have seen that the design was taken one stage at a time and that you havn't had to think about details at the early stages but progressed logically by breaking each step into manageable chunks.

There is never just one solution to a problem. Sometimes a more complex design lends itself to easier modification at a later stage. Always try to look for alternate solutions.

## Problem No. Two

Let's take a look at another design. Some time ago I was working on a program for a sales ledger. This was written in Pascal on a mainframe

computer but I re-coded it into Commodore Basic to show that you can use any language. As the design was already proven it ran first time on my C64.

My favoured method is to design a complex program in fairly small modules, thoroughly testing each, before incorporating them into a final design. This avoids the problem of de-bugging a very large program in one go.

Figure 16 shows the Top Down design for part of the program. This segment reads in three items of information about a stock item (its description, quantity and price) and displays them in a table with total quantities and discount prices. Listing 1 is the source code in Pascal and Listing 2 is the same design in Commodore Basic. The only change that I made was to incorporate some test data at the end to avoid having to create a data file on disk first.

This listing is heavily commented to show how the code follows the design. It is good practice to comment your programs this way as it is a good aid to de-bugging and later modification. You can always remove the comments from a working BASIC program to speed it up a little.

You will notice that the top down design includes a box marked INITIALISE VARIABLES. This is included because many languages require that all variables, etc are defined before they are used.

There is another box, INITIALISE CONSTANTS. It is good programming practice to use constants wherever possible and to put these high up in the program, so that they can be easily modified if the need arises. Here they are used for the discounts given and so will probably change during the lifetime of the program.

The rest of the design should be easy to follow from what you have already learnt.

That's the lot then. If you make a conscious effort to use Top Down Design in all your future projects you will soon gain the experience to be able to design efficient, well structured programs that are a pleasure to code and much easier for others to follow. Who knows? Perhaps one day magazines will start to include Top Down Designs in their pages and allow the reader to program them in their favourite language. Don't just sit there, get designing your next, wordbeating, program.

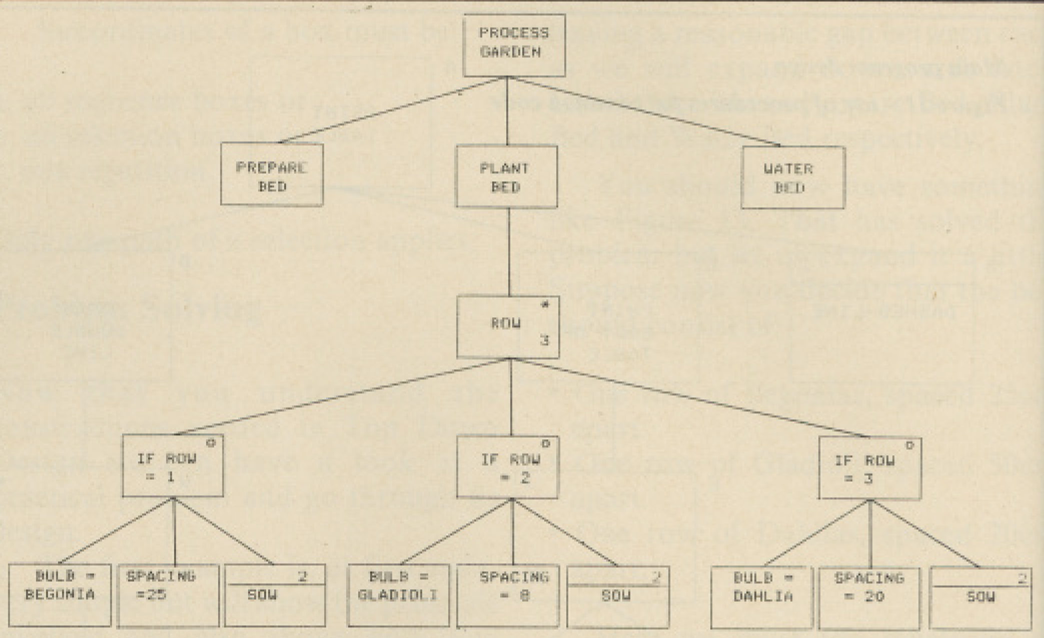
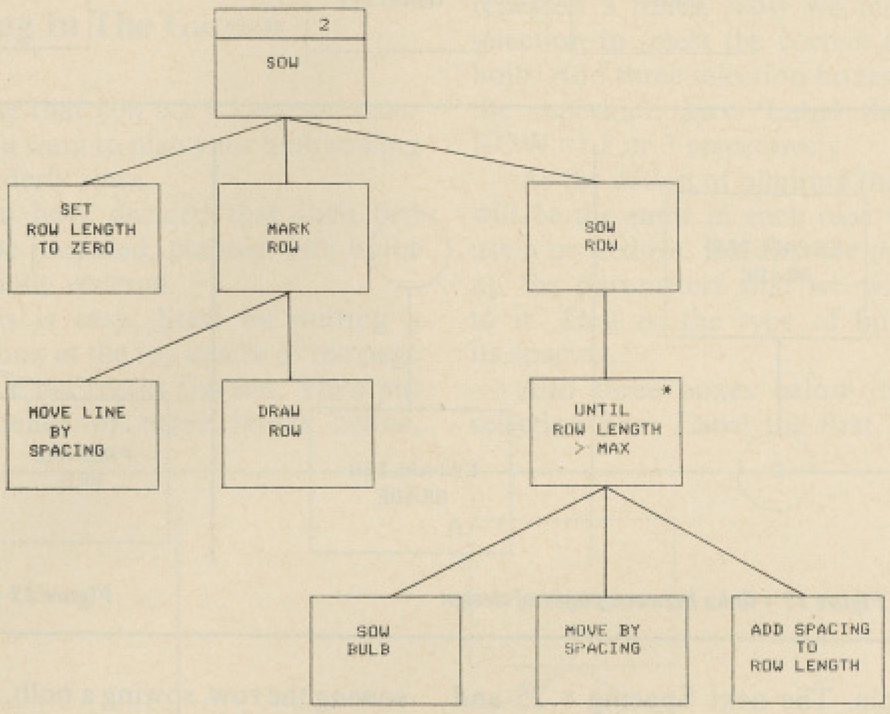



*Figure 14 – solution to gardening problem*

*Figure 15 – procedure for gardening design*



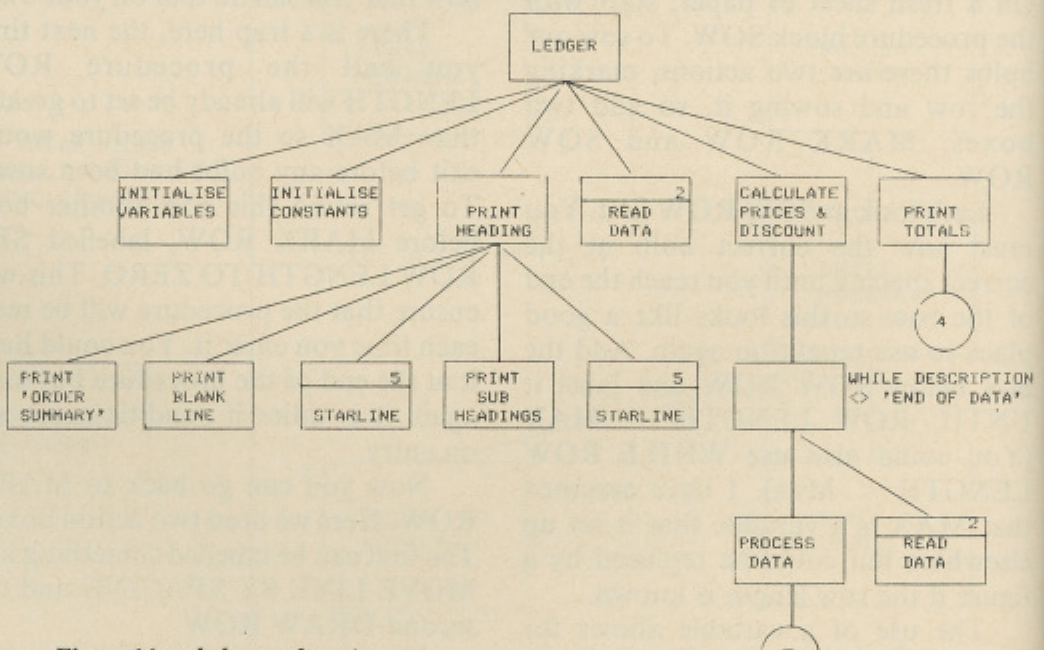




*Figure 16a – ledger – sheet 1*

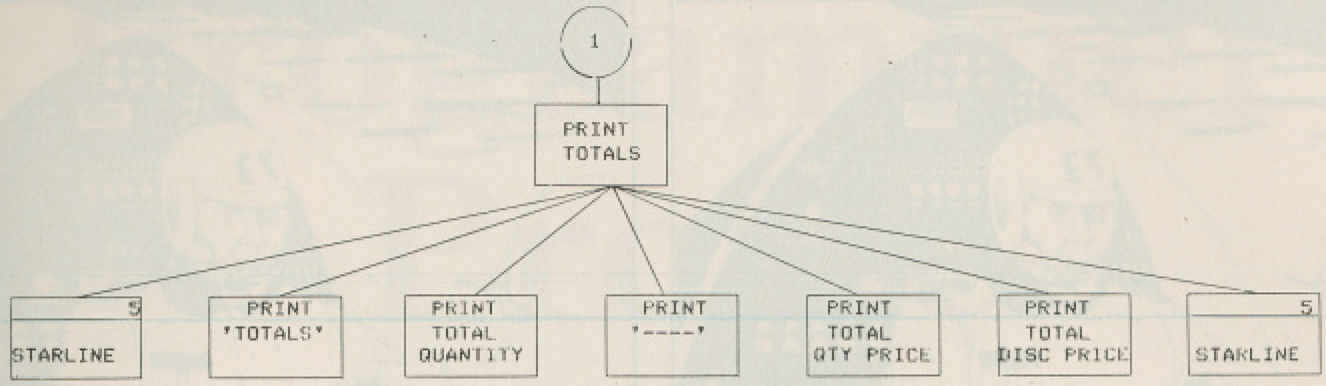



*Figure 16d – ledger – sheet 3*

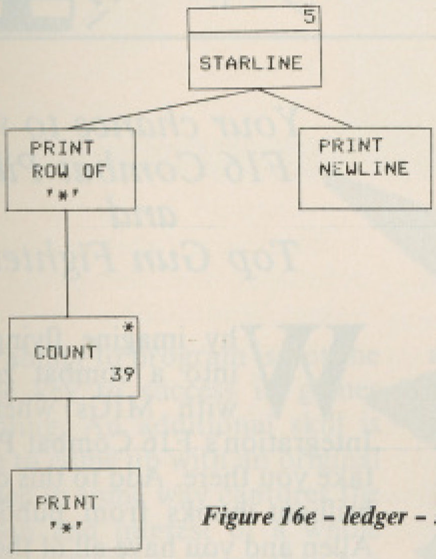



*Figure 16e – ledger – sheet 4*

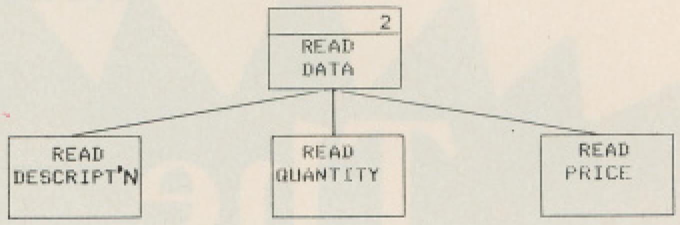



*Figure 16f – ledger – sheet 5*

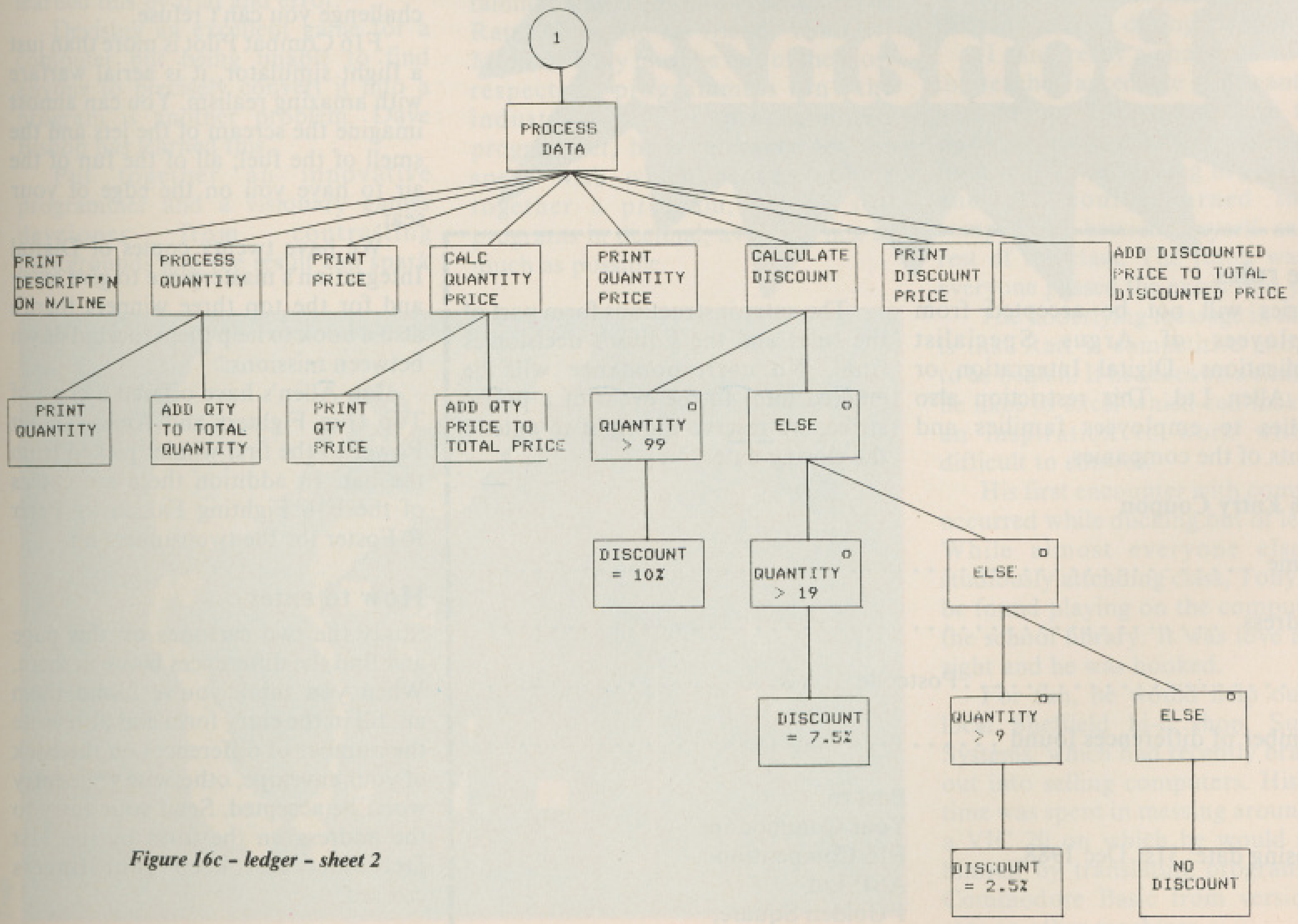
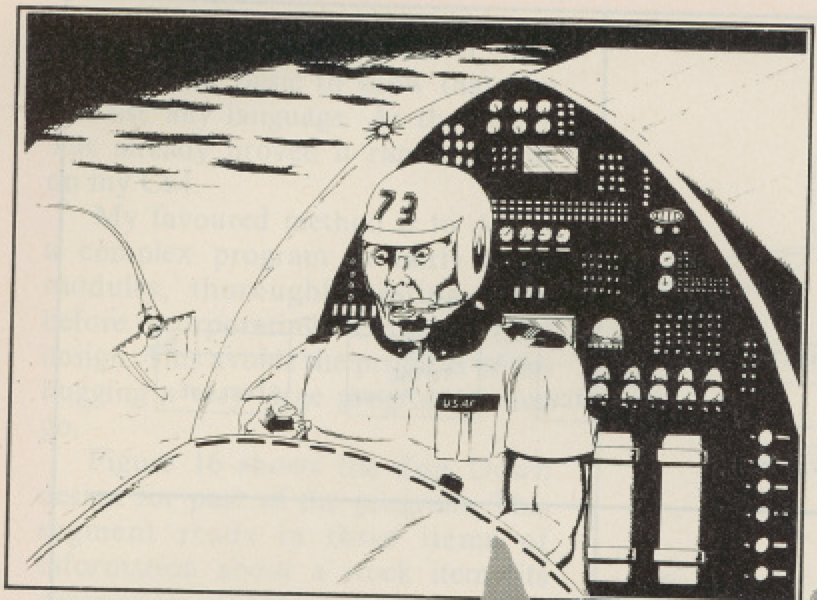
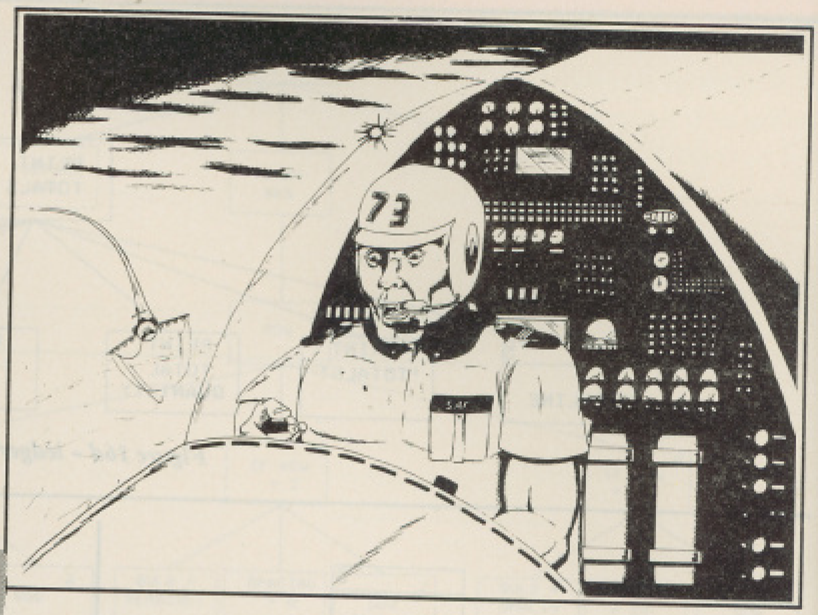



*Figure 16c – ledger – sheet 2*




# The Fantastic Combat Bonanza

## *Your chance to win F16 Combat Pilot and Top Gun Fighters*

Why imagine flying an F16 into a combat zone filled with MIGs when Digital Integration's F16 Combat Pilot could take you there. Add to this one of two brilliant books from publishers Ian Allen and you have all of the elements that makes this competition a challenge you can't refuse.

F16 Combat Pilot is more than just a flight simulator, it is aerial warfare with amazing realism. You can almost imagine the scream of the jets and the smell of the fuel; all of the fun of the air to have you on the edge of your seat.

We have twenty copies of Digital Integration's masterpiece to give away and for the top three winners there's also a book to help them to wind down between missions.

Ian Allen's have offered a copy of Top Gun Fighters and American Jet Power to the first winner picked from the hat. In addition there are copies of the F16 Fighting Falcon by Peter R Foster for the two runners up.

### How to enter

Study the two cartoons on this page and find the differences between them. When you think you've found them all, fill in the entry form and also write the number of differences on the back of your envelope, otherwise your entry won't be accepted. Send your entry to the address on the form by the 31st December and keep your fingers crossed.

### The rules

Entries will not be accepted from employees of Argus Specialist Publications, Digital Integration or Ian Allen Ltd. This restriction also applies to employees families and agents of the companies.

The entry instructions form part of the rules and the Editor's decision is final. No correspondence will be entered into. In the event of a postal strike, we reserve the right to extend the closing date.

**F16 Entry Coupon**

Name ..........................................................

Address ......................................................

......................... Postcode ..................................

Number of differences found ...................................

Closing date: 31st Dec 1988

Post to:
Your Commodore
F16 Competition
ASP Ltd
1 Golden Square,
London W1R 3AB

# Programmer Profile

*Individually, Tony Crowther and Dave Bishop have enviable reputations but now they have combined forces.*

***By Eric Doyle***

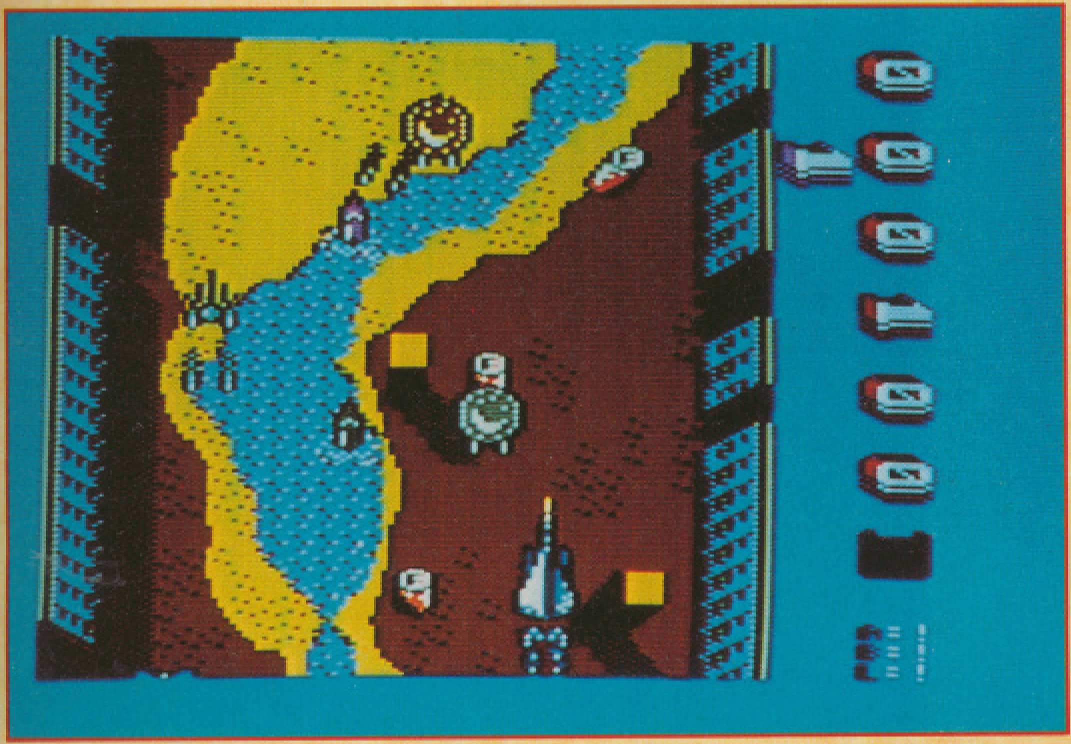
The ability to program is not the sole key to success in games writing. An additional skill is to be able to come up with an original game which in some way captures the imagination and interest of a whole range of people. Tony Crowther has learned this by trial and error.

Devising an excellent game for a computer but being unable to find anyone to precisely convert it into a program is another problem. Dave Bishop has learned this.

Put together an innovative programmer and a visionary games developer from contrasting backgrounds and the result can spark as brightly as an arc lamp. The combination of Crowther and Bishop could set the software world alight.

## Ratt's Tale

Anyone who has watched scrolling messages on Compunet demos will be familiar with Tony Crowther's alias of Ratt. Alongside his friend, Yak (Jeff Minter), Tony must be one of the most respected programmers in the industry. A programmer's programmer, he is renowned for the speed with which he can cobble together a program, yet he still programs in decimal, avoiding hex as much as possible.



Trap

At school, Tony was never very good with figures, in fact, he was not very interested in academic subjects generally but he could relate to anything with a practical application. Not surprisingly, his main interest at A level was Technical Drawing though he supported the course more in spirit than in the flesh during his first year.

"I can't resist a challenge so when the teacher asked me if I wanted to pass or not I started to take things more seriously. Halfway through the final year I was turning in good work and the course turned into a competition between myself and the rest of the class. The result was that everyone passed the exam that year!"

The underlying message in this tale is that Ratt is competitive and hates to be beaten. If he takes on a challenge, he likes to excel which can make him an inspiration to work with but difficult to control.

His first encounter with computers occurred while ducking out of lessons. While almost everyone else was studiously attending class, Tony could be found playing on the computers in the school library. It was love at first sight and he was hooked.

For fun, he would help out at a local Sheffield hi-fi shop, Superior Systems, which had recently branched out into selling computers. His spare time was spent in messing around with a VIC 20 on which he would amuse himself by translating programs into Commodore Basic from versions he saw on other machines.

Although his own version of an adventure like Golden Arrow was an exciting project at that time, the lack of speed lured him to try his hand at machine code. Armed with a crude monitor and a copy of Nick Hampshire's *VIC Revealed* it wasn't long before someone at Superior Systems started to take notice of the demos he was producing and a long, but not uneventful, relationship with Alligata Software was born.

Tony openly admits that his ultimate aim is to achieve fame and glory. He would love to have created Pacman or to have been in Geoff Crammond's shoes as the originator of Sentinel. Consequently, one criticism of the younger Tony was that he would guard his projects jealously and refuse outside 'interference' no matter how well meant it may have been.

Eventually, he felt that staying with Alligata was not in his best interests, switched to Gremlin for a while and then found total freedom with Wizard Developments. *William Wobbler* was his final project with the company and, technically, one of his greatest achievements but the sales were disappointing and with the demise of the company he returned to Alligata but on a better footing than before.

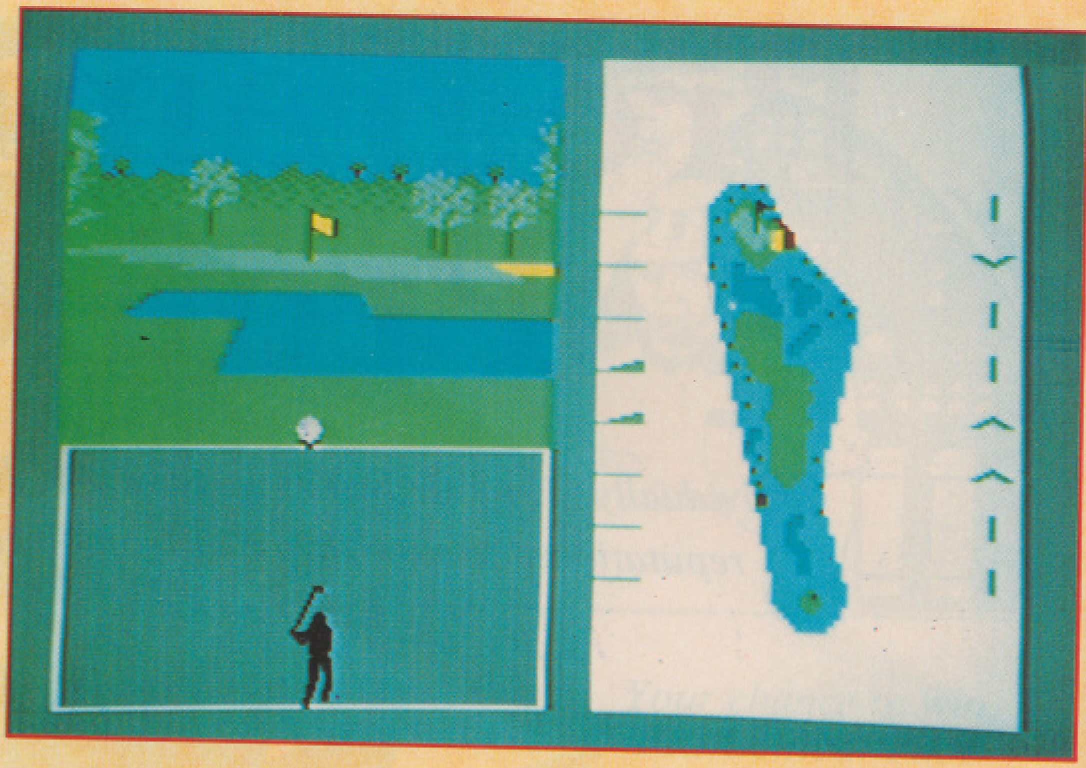
Unfortunately, Alligata's moon was starting to wane and despite great critical acclaim for Ratt's *Trap* and a large advertising campaign, the game flopped badly and the follow-up *Kettle* went much the same way.

About this time, Ariolasoft released Electronic Arts' *Marble Madness* which Tony saw as a good idea gone bad. Two weeks later, armed with his own demo version of the game, he approached Ariolasoft with all the cheek of Yosser in the TV series *Boys from the Black Stuff.* It's almost possible to visualise Tony, slapping the Crowtherised Marble Madness into the nearest disk drive, saying, "I could do that. Gi'us a job."

The team at Ariolasoft were impressed but couldn't release the game because they didn't hold the external rights to the game. They did, however, give him a job.

Once more Tony's ambitions were curtailed by Ariolasoft hitting hard times. Electronic Arts decided to control their own operations in this country and Ariolasoft's other mainstay, Broderbund, had already deserted to the US Gold banner.

This was the long and torturous path which led Tony to Mirrorsoft's door, and his teaming up with Dave Bishop.



*Golf Construction Set*

## The Bishop's Tale

Dave Bishop has been involved with computers for several years but he has never been interested in programming. For him, the thrill is to devise the games he'd like to see and leave the rest to programming specialists like Tony.

On leaving Aston University with a Degree in Marketing, he worked for a while as buyer for the Games Centre chain before setting himself up as a distributor for Vulcan chess computers. During this period, Dave also imported the first Spectravideo Quickshot joysticks and their success pulled him firmly into the world of computer games.

During a spell as the software developer for Hungarian software house, Andromeda, he forged close links with Ariolasoft. When he later launched his own public relations and game design company, Tigress Marketing, Ariolasoft snapped up programs like *Deactivators, They Stole A Million* and *The Golf Construction Set.* Strangely enough, this was happening at the same time as Tony was working with the company.

In mid-1986 Bish cut loose and became a freelance games designer working for companies like Magnetic Scrolls and Real Time (British Telecom's main suppliers and program developers), Mirrorsoft and Psygnosis.

When Ratt and Bish were teamed up for Mirrorsoft's new Image Works label, they formed an immediate



*Chinese Juggler*

mutual appreciation society.

"Tony's really great to work with. He's got it sussed and knows what he's doing. He'll try anything. When I showed him the design for Zig Zag, he said it was impossible so I shelved the idea. A week later I had received his demo and it was up and running!"

"Bish seems to pull his ideas out of thin air. Just before Christmas, he was visiting our house. I went to bed and the following morning I found that he'd woken up at about four o'clock with the idea for Bombuzal. By breakfast time the gameplay had been sorted out and the game was ready for me to start work on. By Christmas, the first demo of the game was ready for approval as a special present for Image Works."

The Bombuzal project was shelved for a while in favour of Fernandez Must Die but that didn't stop work on the game. As a result, Bombuzal is ready for launch within weeks of the critically acclaimed Fernandez.

## Hopes and Fears

Tony realises that the Commodore 64 can't go on forever but, even for such a seasoned programmer, the thought of tackling the Amiga hangs over him like a dark shadow.

"I wish I was like Ross, he can turn his hand to anything. Show him a machine with a microprocessor and he'll master it."

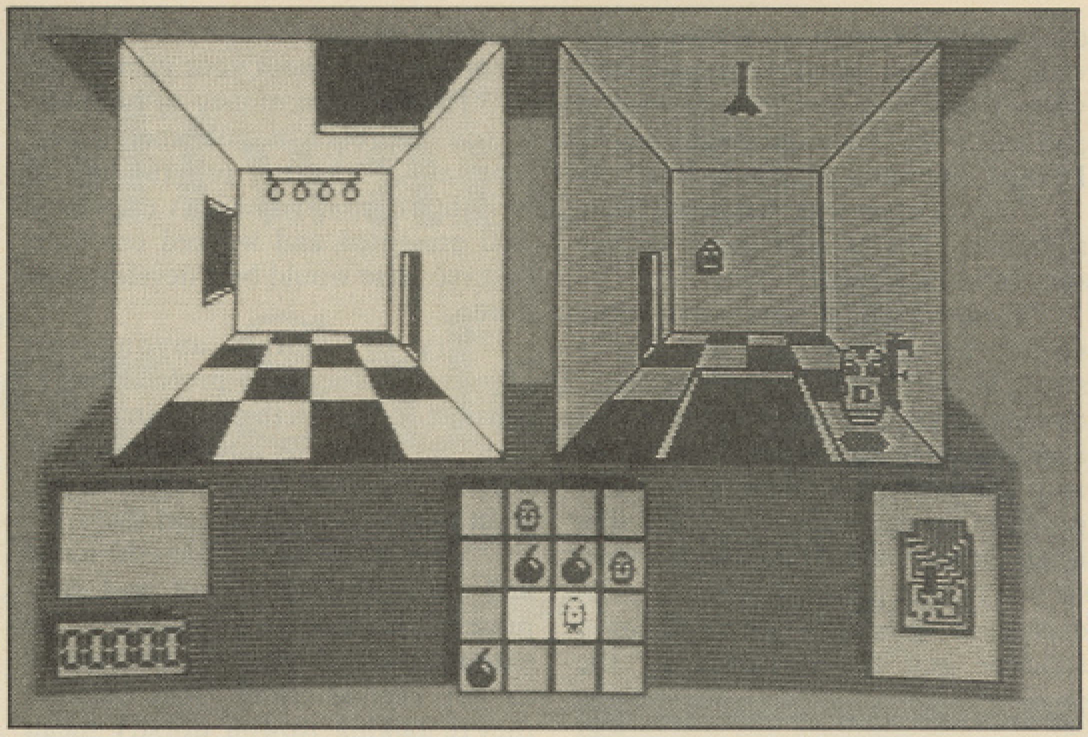
Ross Goodley, friend and long-time associate, has been with Tony from the Alligata days of yore, through Ariolasoft and is now working on the ST version of Bombuzal for Image Works. Unlike Ross, Tony feels that he needs to study a computer for some time and he's now very excited about his first pure Amiga project, Phobia.

"I wanted to quietly try programming something on the Amiga so I worked out the gameplay for Phobia myself. When I started to feel that it would work, Bish moved in and developed the gameplay further.

"I always want my games to be perfect and often I get an idea which means a totally new approach and programming starts again from scratch. This happened with Phobia, in fact it always happens, I just can' help it."

One thing Tony can't stand is the current trend of porting ST games across to the Amiga.

"Anyone who thinks that the ST is as good as the Amiga has got things totally wrong. The potential of the



*Deactivators*

Amiga to produce arcade quality sound and graphics is being underrated. Barring Zenon, all the games I've seen so far look tacky. It would be better if games were developed on the Amiga and then modified for the ST."

One of the many things that Tony and Dave have in common is their unconventional lifestyle.

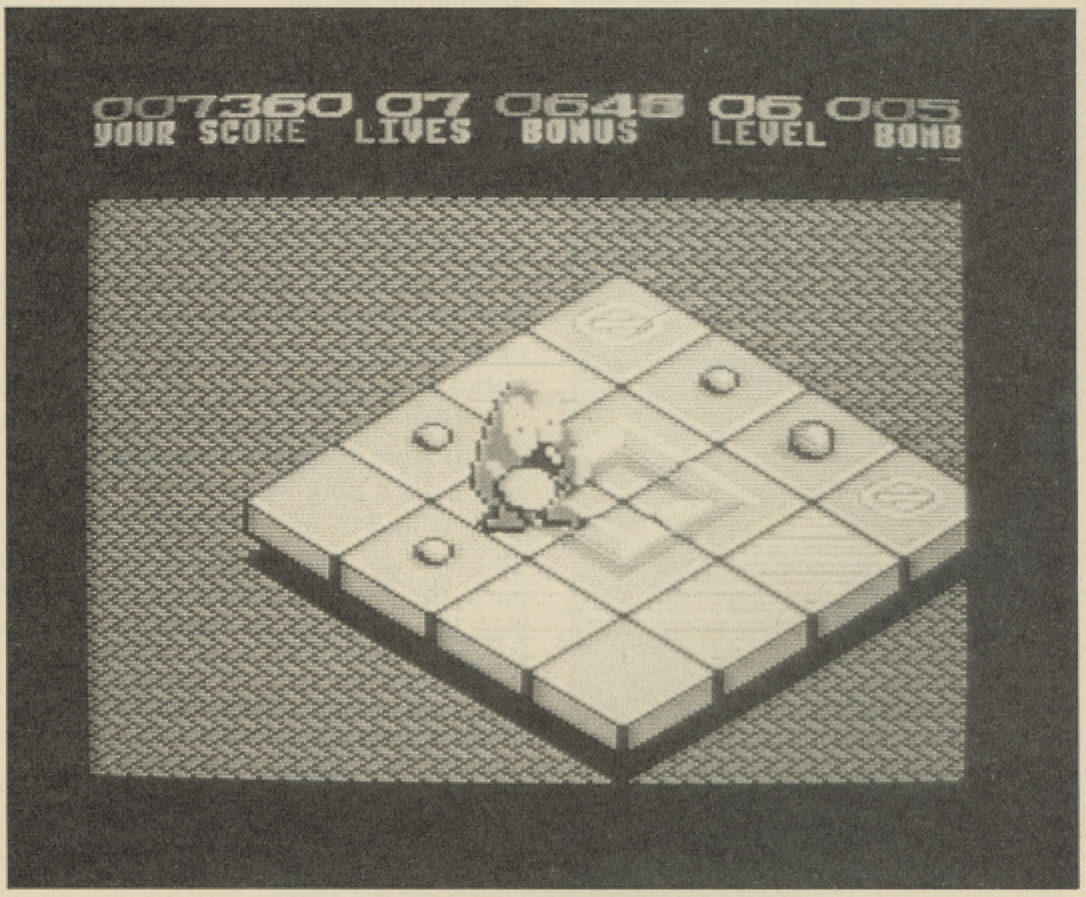
"I must be getting older. I used to have all of my computers set up on the floor and I'd program them while lying on a large bean bag. At the PC Show I bought a large computer desk and chair."

A typical day for Tony starts at 3 o'clock in the afternoon. He'll then program through till about six, the following morning. He then spends a couple of hours watching videos of the TV programmes he may have missed while he was working. These are recorded by his extremely understanding and patient wife, Lisa.

## Plans and Schemes

Dave Bishop's life is slightly more conventional, unless an idea hits him.

"Some of my ideas are sparked off by seeing a game and thinking how it could be made better but occasionally I'll be inspired by a




*Bombuzal*

dream. My dream games are extremely vivid and I can recall them quite well when I wake up so I have to grab a pen and write down the details before I forget, nomatter what time it is."

Years of experience has given Dave a definite idea of how game designs should be marketed.

"First of all, a new game plan should be original and not just a straight copy of something that already exists. The next stage is to find a publisher or development group to take on your idea. Even if you can program the game yourself, marketing is an expensive business to do well, so you're best advised to get a non-disclosure agreement drawn up by a solicitor and get it signed by the company you approach before you tell them anything about your game.

"There's more money to be made if you approach a publisher direct, especially if you're a programmer as well, but if your game isn't extremely well presented and worked out your best recourse would be a development group.

"Try to impress anyone you approach by being as professional as possible. Research the company, make sure they would be interested in your type of game and work out what you want to say before you meet them.

"Start off by telling them the name and the aim of the game and then present the game as a storyboard. Be enthusiastic but resist the temptation to get carried away. Just because they're talking to you doesn't mean they'll be easily sold on the idea.

"If possible, get an advance but in every case insist that you have a signed contract, making sure you let a solicitor see it before you accept. Don't be in a rush to sign, if your idea's good, they'll wait.

"Ask about what will happen if the game is released abroad and, if the company has an affiliate label in the States make sure that you get a percentage of the American income and not merely a one-off rights payment.

"If the game is going to be converted to a range of computer systems ask for a percentage as the originating author."

Dave is also sceptical when it comes to launching anything into the USA market.

"A game has to be cost effective for a publisher to be interested. If it's going to the States it must be convertible to the PC because 45-50% of the machines over there are PC. Don't be fooled by offers of vast ST sales – the ST is dead and ready for burial over there."

When asked what programs he'd like to have designed, Dave's memory goes back a long way.

"I'd like to have designed *Elite* at the time it was launched. Looking back, the game seems fairly trivial now but at the time it was a major breakthrough.

"Other games in my top ten include the Macintosh version of *Deja Vu* and *Hitchhiker's Guide to the Galaxy*. *Revs* I rate as the best every driving game and Electronic Arts' *MULE* is a long time favourite.

"Although I'm currently hooked on *Dungeon Master, Sentinel* stands head and shoulders above any other game I've ever seen. It's 100% original and Geoff Crammond is nothing short of a genius in my opinion. A truly great mind.

"Next to Crammond, I also respect Jeremy Sans' and David Braben's work."

Sentinel is yet another area for agreement between Dave and Tony. As free agents, it's not a forgone conclusion that their professional lives will run parallel for long. The bond of respect that obviously links them should ensure they work on several more projects before the call of other challenges becomes too strong to resist.



**The Ratt Pack**

*Alligata*
**Son of Blagger**

*Gremlin*
**Potty Pigeon**
**Monty Mole**

*Wizard Developments*
**Black Thunder**
**Griffin**
**William Wobbler**

*Alligata*
**Trap**
**Kettle**

*Ariolasoft*
**Killer Rings**
**Gobots**
**Centurians**

*Image Works*
**Zig Zag**
**Fernandez Must Die**
**Bombuzal**



**Bish's Pieces or some of them!**

*Mirrorsoft*
**Caesar the Cat**

*Ocean*
**Chinese Juggler**
**Chink**

*Ariolasoft*
**Golf Construction Set**
**Deactivators**
**They Stole A Million**
**Mean Streak**

*Image Works*
**Zig Zag**
**Fernandez Must Die**
**Bombuzal**

# Software for Sale

*If you think that one of our programs looks very interesting, but you can't afford the time to type it in then our software service will help you out*

It's three o'clock in the morning. You sit at the computer keyboard having just finished a marathon typing session entering one of the superb programs from *Your Commodore*. Your fingers reach for the keyboard and press the letters R, U and N. You press RETURN, sit back and nothing happens.

Everyone has probably faced this problem. When it does happen it's a matter of spending hours searching through the program for any typing mistakes. No matter how long you look or how many people help you, you can usually guarantee that at least one little bug slips through unnoticed.

The *Your Commodore* Software Service makes available all of the programs from each issue on both cassette and disk at a price of £6.00 for disk and £4.00 for cassette. None of the documentation for the programs is supplied with the software since it is all available in the relevant magazine. Should you not have the magazine then back issues are available from the following address:

INFONET LTD, 5 River Park Estate, Berkhamsted, Herts HP4 1HL.
Tel: (04427) 76661

Please contact this address for prices and availability.

## The Disk

Programs on the disk will also be supplied as totally working versions, i.e. when possible we will not use Basic Loaders thus making use of the programs much easier. Unfortunately at the moment we cannot duplicate C16 and Plus/4 cassettes. However programs for these machines will be available on the disk.

What programs are available?

At the top of each article you will find a strap containing the article type, C64 Program etc. So that you can see which programs are available on which format, you will also find a couple of symbols after this strap. The symbols have the following meaning:

This symbol means that the program is available on cassette.

These programs are available on disk.

## Please Note

Since the programs supplied on cassette are total working versions of the program, we do not put disk-only programs on tape. There is no sense in placing a program that expects to be reading from disk on to tape.

**JULY '88**

**EASIPRINT** — Now C16 and Plus/4 owners can access their printer functions with a set of 60 easy to use Basic commands (available on disk only).

**HANDY INPUT ROUTINES** — Make your Basic programs idiot-proof and more attractive with these two Basic input routines (C64).

**MAKING MUSIC** — A simple C64 synthesiser to accompany our popular series.

**DIY PARALLEL INTERFACE** — Use this software and a lead of your own manufacture to drive a Centronics printer (C64).

**CP/M CENTRONICS INTERFACE** — Give your 128 in CP/M mode access to a Centronics printer..

**CASSETTE INLAY PRINTER** — Use your printer to produce neat inlays for your cassette collection (C64).

**DISKASSEMBLER** — Dissassemble your programs direct from disk with this program for the C64 (Disk Only).

**ORDER CODE**
**DISK YDJUL88 £6.00**
**TAPE YCJUL88 £4.00**

**AUGUST '88**

**MAKING MUSIC** — Programs to accompany August's installment of our super music series (C64).

**SHORT INTERLUDE** — Overcome the problems of handling more than one interrupt with this handy routine for machine code programmers (64).

**TAPE ORGANISER** — A high speed program filing system for cassette users. (C64).

**SPILT BAUD RATE TERMINAL** — Drive an RS232 modem with this TTY software for C64 or C128.

**SPRITE LIBRARY** — Aeroplanes are the subject of this installment (C64).

**EDUCATING SYDNEY** — Create an image of the SID chip in memory so that you can see what it's up to whenever you require (C64).

**SIMPLE** — Give your Plus/4 the facility to use Icons and

pull down menus. Available on disk only.

**ORDER CODE**
**DISK YDAUG88 £6.00**
**TAPE YCAUG88 £4.00**

**SEPTEMBER 1988**

**MUSIC COMPOSER** – Compose your own three part harmonies on your C64 with this superb package – disk only.
**MUSICAL FX** – An excellent effects generator that allows you to produce sound effects in your own C64 programs.
**SAMPLER 64** – The quality may not be suitable for studio use but you can have great fun using this C64 sound sampler.
C16 Disk Monitor – A superb disk utility for C16 and Plus/4 owners (available on disk only)

ORDER CODE
DISK YDSEP88 £6.00
TAPE YCSEP88 £4.00

**OCTOBER 1988**

**SPRITE LIBRARY** – In this instalment our sprites take on the look of the alphabet (C64)
**SAMPLER 64** – See September 1988 for details (full program on both September and October disks and tapes.)
**SET THE ALARM** – Use the C64's in-built clock as an alarm.
**JACK IN THE BOX** – A handy box utility for Basic and machine code programmers (C64).
**FILE EXTENSION** – Modify your disk directory so that you can load all your programs with ease. (C64 disk only)
**HI-RES/MULTI/COLOUR PLOTTER** – A selection of plot routines for both Basic and machine code programmers. (C64)
**JOYSTICK CURSOR** – Let your joystick emulate the cursor keys (C64).
**HI-RES FILL** – A superb machine code fill routine for all graphics programmers. (C64)
**CODE RELOCATION** – Change your machine code programs so that they will run in any area of your C64's memory.

**ORDER CODE**
**TAPE YCOCT88 £4.00**
**DISK YDOCT88 £6.00**

**NOVEMBER 1988**

**SECRET WRITING** — Learn how to conceal messages and how to protect your Basic programs. (C64)
**PAINLESS WINDOWS** — Extend the power of the C128's WINDOW command.
**UNLOCK HIDDEN 128 POWERS** — Use the full keyset of your C128 in C64 mode.
**WILLIAM TELL** — Fight off the Austrian soldiers in this great C64 arcade game.
**TALKING COMPUTERS** — Use speech synthesisers with your C64.

**ORDER CODE**
**TAPE YCNOV88 £4.00**
**DISK YDNOV88 £6.00**

**DECEMBER 1988**

**YCDEC88 – for the tape**
**YDDEC88 – for the disk.**

Cassettes or disks are available from March 1986. Please ring the editorial office (01-437 0626) for details of these.

ORDER FORM – PLEASE COMPLETE IN BLOCK CAPITALS

| NAME | QTY | TAPE/DISK | ORDER CODE | PRICE |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| **DECEMBER 88** | | **TAPE (£4.00)** | **YCDEC88** | |
| **DECEMBER 88** | | **DISK (£6.00)** | **YDDEC88** | |
| OVERSEAS POST £1 | | | | |
| | | | TOTAL | |

NAME. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

ADDRESS. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

POSTCODE. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

I enclose a cheque/postal order for £. . . . . . made payable to ARGUS SPECIALIST PUBLICATIONS LTD.

All orders should be sent to: YOUR COMMODORE, READERS SERVICES, ARGUS SPECIALIST PUBLICATIONS, 9 HALL ROAD, HEMEL HEMPSTEAD, HERTS HP2 7BH.
Please allow 28 days for delivery.

# Pool of Radiance

*"You are in a dark passageway with a door at the end. You listen at the door and hear hideous noises but still decide to investigate, so you enter and see a small group of orcs playfully torturing a tall, fair girl. The orcs see you and, annoyed at the interruption, lunge at you."*

If you recognise such an encounter, then you have, no doubt, heard of, and probably played, Dungeons and Dragons. If you haven't, then it's about time you started.

Dungeons and Dragons was the first of the so called roleplaying games and directly influenced the writers of the first computer adventures, a whole host of other role playing games and, of course, computer games such as Bard's Tale and the Ultima series.

Many have tried to get the license for the computer version of D&D, or AD&D (Advanced Dungeons and Dragons) as it is now known, but only SSI has succeeded. This is the first game that has resulted from their five year deal with AD&D authors, TSR.

As the game begins, you control a party of six characters that are created by rolling dice to determine their ability scores in Strength, Intelligence, Wisdom, Dexterity, Constitution and Charisma. These scores then decide what type of character they will be. For example, a fighter must be strong to cause more damage when he hits an opponent, a cleric should be wise so he can pray for spells, a thief should have a high dexterity to eanble him to use a bow, and a magic user needs intelligence to learn the spells that he can cast.

You can then decide whether the character will be human, elf, dwarf, halfling or gnome. You can use the icon editor to design how each character will appear on screen or, if you want to start playing straight away, load up the sample party on the disk that contains one fighter, a fighter magician (multi-class characters are allowed), two clerics, a fighter thief and a magic user. When your party is assembled, you begin the game by entering into the city of Phlan.

This was once a great city that gradually fell on hard time as thugs, villains and monsters moved in. Now the council is trying to regain the city it once ruled and to expand it's influence from the small confines of the civilised area into the hostile occupied areas. To this end the council is hiring groups of adventurers to clear areas of the old city. In this game to clear means to risk your life in battles with hidious monsters, evil gang leaders and powerful magic users that see your presence as a minor irritation.

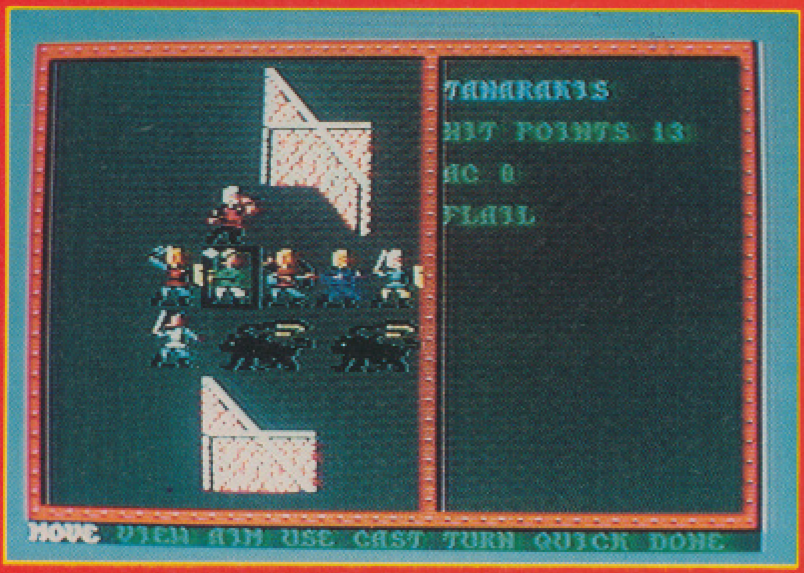
Naturally, it's cash on delivery, once you've completed the mission, and they'll also pay a bounty for gang leaders killed and for any maps and books that were written in the old times. With only a slight feeling of uneasiness, you head off into the area known as the slums.

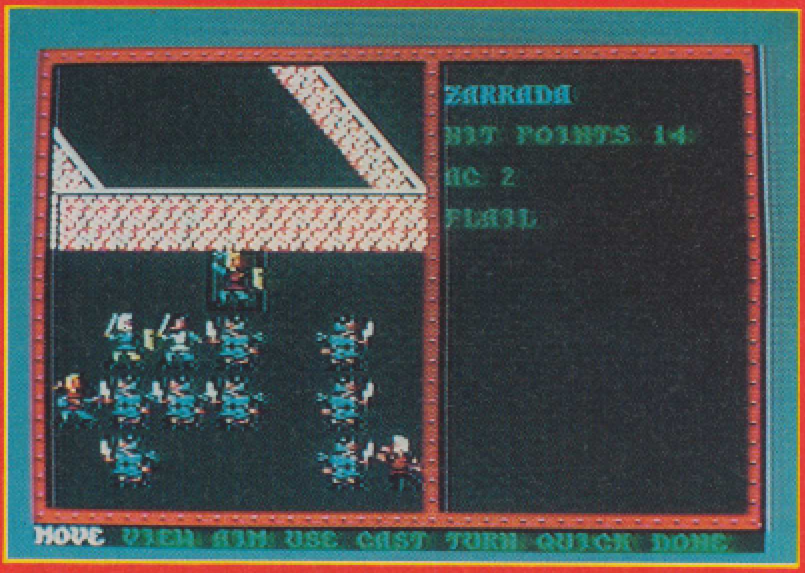
The screen display is similar to many seen in computer roleplaying games and is split into four areas. The main screen is a 3D view of what your party can see and alongside it there is a display that shows the names of your party members, their current armour class (how difficult it is to hit them; the lower the value, the better) and the number of hit points they have remaining. If this figure reaches zero, then the character is unconscious and probably dying.

Beneath this display is a message window and the first of a series of duckshoot menus. These joystick controlled menus allow you to carry






out all the commands and actions that sets this apart from other games. For example, your magic users can memorise, scribe and cast spells, clerics can pray for spells and turn away the undead, fighters can select weapons and thieves can fire thier bows. The party can also set up camp to rest and heal, trade items and examine them to see whether they are magical.

When you meet a group of monsters, you can elect, from options, to attack them, wait and see what they are going to do, run away from them or talk to them in a variety of ways. Sometimes they will retreat or give away valuable information, such as the location of their treasure, but usually these encounters lead to combat.

Whenever combat occurs, the screen display changes to a full-screen, 3D, Gauntlet-style view of the battle where each combatant attacks in turn until the battle is won or lost. When it's the turn of one of your characters to act, another menu will appear through which your character can move, attack, stand on guard, cast a spell (you pick the target with a cursor) or fire a bow.

To the left of the main screen, you literally get a blow by blow commentary of what's happening. It states whether arrows, spells, swords and axes hit their target and what effect, if any, they had. All this gives you total control over the battle tactics and the fate of your party. Tactics are important and it's up to you to decide your own but you should try and take out the enemy leaders and magic users first, to weaken the resolve of the others. When monsters break and flee you can either pursue them and cut them down, or settle with what you've done and heal your wounds.

The best way to heal wounds is for your clerics to cast spells but, if they have none or are laying in a pool of blood, then you will have to rest and gain a hit point for every day you are in camp. This is painfully slow and should be used as a last resort as it also leaves you open to attack from wandering monsters.

As you kill monsters and collect items, you will add to your experience points and, perhaps, impress the tutors at the training centre back in civilisation. However, you will also need 1000 gold pieces which may be more difficult to amass than the experience points. Should you manage both criteria, then your character will be trained, get more hit points and gain other benefits. For example, fighters get additional attacks as they reach higher levels and clerics and magic users can learn more spells from a larger selection. In fact, as they climb up through the levels, the magic users become the most powerful characters, despite beginning as the weakest who need the protection of the others.

Also in the city you will find shops selling weapons and objects that you think may be useful, taverns offering hospitality and rest, temples proffering healing at a price, and the council chamber where you will be rewarded for deeds that you have done.

There is a lot more to Pool of Radiance than mere monster bashing and you can even dispense with most of that by opting for quick combat where the computer controls it all. As you get stronger the commissions you can accept will take you further afield, bring you into contact with more game characters and help you piece together the history of Phlan. Then you will begin to notice that something is very wrong and there is evil at work and you are the people to stop it.

The Pool of Radiance is a massive game and is supplied on four double sided disks that you must copy before you begin so you must make sure you have a stack of nine disks (eight for the game and a ninth for one to save onto) ready before you begin. A disk box would also be useful as there is a fair amount of disk swapping to do and the disk you need is nearly always at the bottom of the pile.

The game disks are accompanied by an instruction book that contains details of the game menus and low level spells, a reference card for C64 game controls, a code wheel that you must use to decipher a copy protection test and the Adventurers journal that contains a host of information such as the monsters you will face and things that you find. These journal entries are numbered and should only be read when the game prompts you to and include maps and fragments of Phlan's history.

Pool of Radiance is a superb role playing game which both benefits and loses out because of the official AD&D label. On the plus side, you are using the weapons and spells you know and fighting the monsters that you have fought before. The minus, that will only effect existing AD&D players, is that the game uses the exact AD&D rules whereas most players only use them as a guide. A small point which is important to some, but most players will enjoy the opportunity to explore the world of Dungeons and Dragons and relish the thought that there are more to come.

**Tony Hetherington**

***Touchline:***
***Title:*** *Pool of Radiance.* ***Supplier:*** *SSI (US Gold), Units 2/3, Holford, Birmingham B6 7AX.* ***Tel:*** *021 356 3388.* ***Price:*** *£24.99 (Disk only).*

# Directory Editor



*Whip your directories into shape and replace chaos with order*

Commodore disk directories suffer from one main drawback; deleting an old file in the middle of the directory leaves an invisible gap which is filled by the next program to be saved.

When you save your next program, its name dissappears somewhere in the depths of the directory instead of being added to the end. This can cause great confusion if you save a program which loads in two or more parts and the parts get separated and spread out.

Directory Editor should alleviate this problem, allowing you to rearrange the directory in any way you see fit. It will also simplify various operations such as locking files and reviving scratched or splat files.

Most of the options are fairly self-explanatory and foolproof but a brief resumé of the commands is necessary.

### DIRECTORY

This shows filename, filetype (including DELeted files), splat and locked files (shown respectively by a * before the file type and a < after it). The directory scrolls up and down under the control of the cursor keys.

Pressing the space bar inserts a space next to the pointer (the > on the left of the screen), and RETURN moves the file beside the pointer to a previously inserted space.

F1 stores the indicated file so that subsequently pressing F1 in other options results in that filename being taken as an input.

ESC returns to the main menu.

### SCRATCH A FILE

The same as Basic SCRATCH.

### UNSCRATCH A FILE

Restores a file which appears in the directory as DEL.

### UNSPLAT A FILE

A splat file is one which was not closed properly. This option will not rebuild files which are splat, but it may allow you to read data and re-write it to another file.

### LOCK A FILE

This allows you to protect a file against being scratched.

### UNLOCK A FILE

This reverses the previous option.

### RENAME A FILE

The same as Basic RENAME.

### ALPHANUMERIC SORT

This sorts all files into alphanumeric order (similar to alphabetical order, but including numbers and punctuation characters). Replying 'Y' to 'Sort by file type?' will group files in the order PRG, REL, SEQ, USR. (If this order doesn't suit you change SO$ in line 1390). Both options place any DELeted files at the end.

### REWRITE DIRECTORY

This option should only be used when all alterations to the directory have been made. Nothing is changed on the disk until you select this.

If you change your mind halfway through and want to leave your disk as it is, press RUN/STOP.

## Run before you work

The program will run, as written, on the Plus/4, C16 and C128, and should be compatible with all drives, although I'm not sure whether it will cope with double sided disks on the 1571. If you have mistyped anything you'll probably have to HEADER your disk again, so try it out first on an unused disk with some dummy programs.

# Listings

*Get it right first time with our deluxe program system for the C64.*

You may have noticed that our listings are free of those horrible little black blobs which send you searching around the keyboard for a suitable graphic symbol. You may also have noticed the funny numbers by the side of each line of the listing. Fret no more, it's all part of our easy entry aid.

Instead of those nasty graphics and rows of countless spaces in PRINT statements and strings we use a special coding system. The code, or mnemonic, is always contained in square brackets and you'll soon learn to decipher their meanings.

For example, [SA] would mean type in a Shifted A, or an ace of spades in layman's terms, and [SA10] would mean a row of ten of these symbols.

[S+2] means hold down the shift key and press the plus key twice. It doesn't take a great leap of logic to realise that [C+2] means exactly the same thing except that the Commodore key (bottom left of the keyboard) is held down instead of the shift key.

If more than two spaces appear in a statement then this will be printed as [SPC4] or, exceptionally, [SSPC4]. Translated into English this means press the spacebar four times or in the latter case hold the shift key down while you do it.

A string of special characters could appear as:

[CTRL N, DOWN2,LEFT5,BLUE, F3,C3]

This would be achieved by holding down the CTRL key as you press N, press the cursor key down twice, the cursor left key five times, press the key marked BLUE while holding down the CTRL key, press the F3 key and, finally hold the Commodore key down while pressing the number two key (C2 would of course make the computer print in brown).

Always remember that you should only have a row of graphics characters on your screen with no square brackets and no commas, unless something like this appears:

[SS],[C*]

In this case the two characters should have a comma between them.

On rare occasions [REV T] will appear in a listing. This is a delete symbol and is created by entering the line up to this mnemonic. Then type a closing quotation mark (SHIFT & 2) and delete it. This gets the computer out of quotes mode. Hold down CTRL and press the number nine key (RVSON), type the relevant number of reversed T's and then hold down CTRL and press zero (RVSOFF). Next type another quotation mark and delete it again. Now finish the line and press RETURN.

A list of these special cases is given in the table but remember that only one of these mnemonics will appear outside of a PRINT string: the symbol for pi. This may appear when its value is needed in a calculation so this may look something like:

:CC=2*[PI]*R:

Ignore the square brackets and just type in a shifted upward pointing arrow (ie. the pi symbol).

```
PROGRAM: SYNTAX CHECKER

 5 REM SYTAX CHECKER - ERIC DOYLE

 10 BL=10    :LN=70    :SA=49152
 20 FOR L=0 TO BL:CX=0:FOR D=0 TO
  15
 30 READ A:IF A>255THENPRINT"NUMB
 ER TO LARGE";LN+(L*10):STOP
 40 CX=CX+A:POKE SA+L*16+D,A:NEXT
  D
 50 READ A:IF A><CX THENPRINT"ERR
 OR IN LINE";LN+(L*10):STOP
 60 NEXT L:SYS 49152:NEW
 70 DATA 173,5,3,201,165,208,31,1
 20,169,9,141,32,208,141,33,208,1
 847
 80 DATA 169,7,141,134,2,169,13,3
 2,210,255,169,64,141,4,3,169,168
 2
 90 DATA 192,141,5,3,88,96,120,16
 9,124,141,4,3,169,165,141,5,1566

 100 DATA 3,169,14,141,134,2,141,
 32,208,169,6,141,33,208,88,96,15
 85
 110 DATA 32,124,165,72,138,72,15
 2,72,162,0,165,20,133,254,165,21
 ,1747
 120 DATA 24,101,254,133,254,189,
 0,2,240,18,69,254,133,254,232,18
 9,2346
 130 DATA 0,2,240,8,24,101,254,13
 3,254,232,208,233,169,1,141,134,
 2134
 140 DATA 2,165,254,74,74,74,74,3
 2,156,192,32,210,255,165,254,41,
 2054
 150 DATA 15,32,156,192,32,210,25
 5,169,13,32,210,255,169,13,32,21
 0,1995
 160 DATA 255,169,7,141,134,2,104
 ,168,104,170,104,96,24,105,48,20
 1,1832
 170 DATA 58,16,1,96,24,105,7,96,
 0,0,0,0,0,0,0,0,403
```

**by Eric Doyle**

## Checksum Program

The hexadecimal numbers appearing in a column to the left of the listing should not be typed in with the program. These are merely checksum values and are there to help you get each line right. Don't worry if you don't understand the hexadecimal system, as long as you can compare two characters on the screen with the corresponding two characters in the magazine you can use our line checking program.

Type in the Checksum Program, make sure that you've not made any mistakes and save it to tape or disk immediately because it will be used with most of the present and future listings appearing in Your Commodore.

At the start of each programming session, load Checksum and run it. The screen will turn brown with yellow characters and each time you type in a line and press the RETURN key a number will appear on the screen in white. This should be the same as the corresponding value in the magazine.

If the two values don't relate to one another, you have not copied the line exactly as printed so go back and check each character carefully. When you find the error simply correct it and press RETURN again.

If you want to turn off the checker simply type SYS49152 and the screen will return to the familiar blue colours. You can then do whatever it was you wanted to do and if this doesn't use the area where Checksum lies you can go back to it with the same SYS command.

No system is foolproof but the chances of two errors cancelling one Many of the listings are presented in lower case. To turn your computer to lower case mode press the Commodore key and the SHIFT key at the same time. YC

| Mnemonic | Symbol | Keypress |
|---|---|---|
| [RIGHT] | | CRSR left/right |
| [LEFT] | | SHIFT & CRSR left/right |
| [DOWN] | | CRSR up/down |
| [UP] | | SHIFT & CRSR up/down |
| [F1] | | f1 key |
| [F2] | | SHIFT & f1 key |
| [F3] | | f3 key |
| [F4] | | SHIFT & f3 key |
| [F5] | | f5 key |
| [F6] | | SHIFT & f5 key |
| [F7] | | f7 key |
| [F8] | | SHIFT & f7 key |
| [HOME] | | CLR/HOME |
| [CLR] | | SHIFT & CLR/HOME |
| [RVSON] | | CTRL & 9 |
| [RVSOFF] | | CTRL & 0 |

| Mnemonic | Symbol | Keypress |
|---|---|---|
| [BLACK] | | CTRL & 1 |
| [WHITE] | | CTRL & 2 |
| [RED] | | CTRL & 3 |
| [CYAN] | | CTRL & 4 |
| [PURPLE] | | CTRL & 5 |
| [GREEN] | | CTRL & 6 |
| [BLUE] | | CTRL & 7 |
| [YELLOW] | | CTRL & 8 |
| [POUND] | | £ |
| [LARROW] | | ← |
| [UPARROW] | | ↑ |
| [PI] | | SHIFT & ↑ |
| [INST] | | SHIFT & INST/DEL |
| [REV T] | | see text |
| [Cletter] | | CBM + letter |
| [Sletter] | | SHIFT + letter |

# YOUR COMMODORE Listings

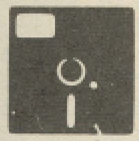
## F-Key Labeller

PROGRAM: FUNCTION KEY TEMPLATE - C64

```
BB  1 POKE 53280,12
B2  10 REM ****BY C. HOWARD****
AB  20 REM ***COMPLETED 8TH AUGU
    ST 1988***
BE  30 REM ***FUNCTION KEY TEMPL
    ATE***
DA  100 DIM F$(8):DIM L(8)
7B  110 SP$="[SPC7]"
32  120 SPC$="[SPC8]"
D0  130 PRINT"[CLR]"
50  140 PRINTTAB(10)"FUNCTION KE
    Y LABELLER"
A0  150 PRINTTAB(15)"[DOWN3]1. E
    DIT F1"
DD  160 PRINTTAB(15)"2. EDIT F2"
E3  170 PRINTTAB(15)"3. EDIT F3"
99  180 PRINTTAB(15)"4. EDIT F4"
73  190 PRINTTAB(15)"5. EDIT F5"
FD  200 PRINTTAB(15)"6. EDIT F6"
53  210 PRINTTAB(15)"7. EDIT F7"
D1  220 PRINTTAB(15)"8. EDIT F8"
A1  230 PRINTTAB(10)"[DOWN2]PLEA
    SE ENTER CHOICE"
93  240 PRINTTAB(15)"[DOWN2,RVSO
    N]P[RVSOFF] TO PRINT"
6C  250 PRINTTAB(15)"[DOWN2,RVSO
    N]Q[RVSOFF] TO QUIT"
8C  260 GET A$:IF A$="" THEN 260
23  270 IF A$="1" THEN GOSUB 100
    0
2D  280 IF A$="2" THEN GOSUB 200
    0
AB  290 IF A$="3" THEN GOSUB 300
    0
09  300 IF A$="4" THEN GOSUB 400
    0
9B  310 IF A$="5" THEN GOSUB 500
    0
A5  320 IF A$="6" THEN GOSUB 600
    0
EB  330 IF A$="7" THEN GOSUB 700
    0
49  340 IF A$="8" THEN GOSUB 800
    0
9C  350 IF A$="P" THEN GOSUB 900
    0
4F  360 IF A$<>"Q" THEN 130
F3  370 END
29  1000 PRINT"[CLR]"
D5  1010 PRINTTAB(10)"LABEL FOR
    F1"
87  1020 PRINTTAB(10)"[DOWN]ENTE
    R DETAILS";
7F  1030 INPUT F$(1)
FC  1060 LET L(1)=LEN(F$(1)):IF
    L(1)>8 THEN 1000
BC  1070 RETURN
05  2000 PRINT"[CLR]"
46  2010 PRINTTAB(10)"LABEL FOR
    F2"
F3  2020 PRINTTAB(10)"[DOWN]ENTE
    R DETAILS";
7E  2050 INPUT F$(2)
E5  2060 LET L(2)=LEN(F$(2)):IF
    L(2)>7 THEN 2000
90  2070 RETURN
11  3000 PRINT"[CLR]"
D3  3010 PRINTTAB(10)"LABEL FOR
    F3"
9F  3020 PRINTTAB(10)"[DOWN]ENTE
    R DETAILS";
2C  3050 INPUT F$(3)
AF  3060 LET L(3)=LEN(F$(3)):IF
    L(3)>8 THEN 3000
87  3070 RETURN
ED  4000 PRINT"[CLR]"
7C  4010 PRINTTAB(10)"LABEL FOR
    F4"
8B  4020 PRINTTAB(10)"[DOWN]ENTE
    R DETAILS";
2B  4050 INPUT F$(4)
22  4060 LET L(4)=LEN(F$(4)):IF
    L(4)>7 THEN 4000
7B  4070 RETURN
D9  5000 PRINT"[CLR]"
09  5010 PRINTTAB(10)"LABEL FOR
    F5"
17  5020 PRINTTAB(10)"[DOWN]ENTE
    R DETAILS";
86  5050 INPUT F$(5)
CF  5060 LET L(5)=LEN(F$(5)):IF
    L(5)>8 THEN 5000
6F  5070 RETURN
F5  6000 PRINT"[CLR]"
1A  6010 PRINTTAB(10)"LABEL FOR
    F6"
C3  6020 PRINTTAB(10)"[DOWN]ENTE
    R DETAILS";
65  6050 INPUT F$(6)
7A  6060 LET L(6)=LEN(F$(6)):IF
    L(6)>7 THEN 6000
43  6070 RETURN
C1  7000 PRINT"[CLR]"
67  7010 PRINTTAB(10)"LABEL FOR
    F7"
EF  7020 PRINTTAB(10)"[DOWN]ENTE
    R DETAILS";
10  7050 INPUT F$(7)
6F  7060 LET L(7)=LEN(F$(7)):IF
    L(7)>8 THEN 7000
37  7070 RETURN
9D  8000 PRINT"[CLR]"
D0  8010 PRINTTAB(10)"LABEL FOR
    F8"
DB  8020 PRINTTAB(10)"[DOWN]ENTE
    R DETAILS";
DF  8050 INPUT F$(8)
1A  8060 LET L(8)=LEN(F$(8)):IF
    L(8)>7 THEN 8000
2B  8070 RETURN
70  9000 FOR I=1 TO 7 STEP2
16  9010 LET F$(I)=F$(I)+RIGHT$(
    SPC$,8-L(I))
4A  9015 L(I)=8
B4  9020 NEXT I
06  9030 FOR I=2 TO 8 STEP2
8C  9040 LET F$(I)=F$(I)+RIGHT$(
    SP$,7-L(I))
C3  9045 L(I)=7
56  9050 NEXT I
94  9060 OPEN4,4
13  9070 PRINT#4,"[CA,S*28,CS]"
1F  9080 PRINT#4,"[S-,SPC28,S-]"
DD  9090 PRINT#4,"[S-,SPC28,S-]"
05  9100 PRINT#4,"[S-,SPC7,CA,S*
    11,CS,SPC8,S-]"
B0  9110 PRINT#4,"[S-]F2[SPC5,S-
    ,SPC11,S-]F1[SPC6,S-]"
57  9120 PRINT#4,"[S-,SPC7,S-,SP
    C11,S-,SPC8,S-]"
1E  9130 PRINT#4,"[S-]";F$(2);"[
    S-,SPC11,S-]";F$(1);"[S-]"
4B  9140 PRINT#4,"[S-,SPC7,S-,SP
    C11,S-,SPC8,S-]"
01  9150 PRINT#4,"[CQ,S*7,CW,SPC
    11,CQ,S*8,CW]"
3A  9160 PRINT#4,"[S-]F4[SPC5,S-
    ,SPC11,S-]F3[SPC6,S-]"
BA  9170 PRINT#4,"[S-]";F$(4);"[
    S-,SPC11,S-]";F$(3);"[S-]"
43  9180 PRINT#4,"[S-,SPC7,S-,SP
    C11,S-,SPC8,S-]"
29  9190 PRINT#4,"[CQ,S*7,CW,SPC
    11,CQ,S*8,CW]"
2A  9200 PRINT#4,"[S-]F6[SPC5,S-
    ,SPC11,S-]F5[SPC6,S-]"
```

```
26  9210 PRINT#4,"[S-]";F$(6);"[S-,SPC11,S-]";F$(5);"[S-]"
36  9220 PRINT#4,"[S-,SPC7,S-,SPC11,S-,SPC8,S-]"
D8  9230 PRINT#4,"[CQ,S*7,CW,SPC11,CQ,S*8,CW]"
D7  9240 PRINT#4,"[S-]F8[SPC5,S-,SPC11,S-]F7[SPC6,S-]"
B8  9250 PRINT#4,"[S-,SPC7,S-,SPC11,S-,SPC8,S-]"
FF  9260 PRINT#4,"[S-]";F$(8);"[S-,SPC11,S-]";F$(7);"[S-]"
DC  9270 PRINT#4,"[S-,SPC7,S-,SPC11,S-,SPC8,S-]"
D2  9280 PRINT#4,"[S-,SPC7,CZ,S*11,CX,SPC8,S-]"
70  9290 PRINT#4,"[S-,SPC28,S-]"
46  9300 PRINT#4,"[S-,SPC28,S-]"
C4  9310 PRINT#4,"[CZ,S*28,CX]"
60  9320 CLOSE4
18  9330 RETURN
```

## +4 Directory Editor

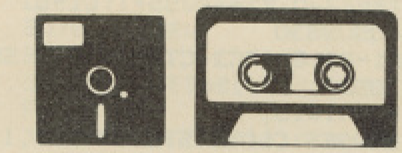


PROGRAM: +4 DIR EDITOR

```
10 GOTO80
20 IFASC(MID$(DF$(W),2,1))=0THEN70
30 N=ASC(DF$(W)):FT=NAND7:SL=NAND128:LK=NAND64:NM$=MID$(DF$(W),4,16)
40 IFSL=0ANDFT<>0THENSL$="*":ELSESL$=" "
50 IFLKTHENLK$="<":ELSELK$=" "
60 IFASC(DF$(W))<>32THENPRINTCHR$(34)NM$CHR$(34)" "SL$FT$(FT)LK$;:ELSEPRINTNM$
70 RETURN
80 TRAP680:PRINT""CHR$(142)
90 DIMDF$(144),Q(16),FT$(7):ES$=CHR$(27)
100 FORT=0TO7:READFT$(T):NEXT
110 DATADEL,SEQ,PRG,USR,REL,???,???,???
120 BD$="":PO$=""
130 GRAPHIC1,1
140 FORT=2TO8:KEYT,"":NEXT:KEY1,CHR$(133)
150 PRINT"          DISK DIRECTORY EDITOR"CHR$(8)
160 CHAR1,9,1,"DISK DIRECTORY EDITOR"
170 PRINT"────────────────"ES$"T"
180 CHAR1,0,2,"────────────────"
190 GRAPHIC0
200 PRINT"INSERT DISK INTO DRIVE"
210 PRINT"AND PRESS RETURN."
220 GETKEYA$:IFA$<>CHR$(13)THEN220
230 TRAP740
240 OPEN15,8,15
250 OPEN5,8,5,"#"
260 PRINT#15,"U1:5,0,18,0":PRINT#15,"B-P:5,144"
270 N$="":FORT=1TO16:GET#5,A$:N$=N$+A$:NEXT
280 GET#5,A$:GET#5,A$:GET#5,ID$:GET#5,A$:ID$=ID$+A$
290 PRINT"DISK NAME : "N$
300 PRINT"ID : "ID$
310 PRINT"OK TO READ DIRECTORY"ES$"Q";:INPUTA$
320 IFLEFT$(A$,1)="N"THENCLOSE5:CLOSE15:TRAP680:GOTO200
330 IFLEFT$(A$,1)<>"Y"THEN310
340 PRINT"READING DISK DIRECTORY"
350 PRINT"PLEASE WAIT"
360 TT=18:SS=1:C=0
370 GOSUB750
380 IFTT<>0THEN370
390 TRAP680
400 PRINT"1:DIRECTORY"
410 PRINT"2:SCRATCH A FILE"
420 PRINT"3:UNSCRATCH A FILE"
430 PRINT"4:UNSPLAT A FILE"
440 PRINT"5:LOCK A FILE"
450 PRINT"6:UNLOCK A FILE"
460 PRINT"7:RENAME A FILE"
470 PRINT"8:ALPHANUMERIC SORT"
480 PRINT"9:REWRITE DIRECTORY"
490 GETKEYA$:IFA$<"1"ORA$>"9"THEN490
500 IFA$="9"THEN530
510 ONVAL(A$)GOSUB1470,830,870,980,1040,1050,1120,1210
520 GOTO400
530 PRINT"REWRITE DIRECTORY"
540 PRINT"ARE YOU SURE"ES$"Q";:INPUTA$
550 IFLEFT$(A$,1)="Y"THEN570
560 IFLEFT$(A$,1)="N"THEN400:ELSE540
570 TRAP740:TT=18:SS=1:C1=0
580 GOSUB630
590 C1=C1+8:IFC1<CTHENTT=T1:SS=S1:GOTO580
600 PRINT#15,"V"
610 CLOSE5:CLOSE15:GRAPHIC1,1:SYS62364:SYS64756:GRAPHIC0,1
620 PRINT"DIRECTORY NOW REWRITTEN":TRAP:END
630 PRINT#15,"U1:"5;0;TT;SS
640 GET#5,A$:T1=ASC(A$):GET#5,A$:S1=ASC(A$)
650 FORX=0TO7:BP=2+32*X:PRINT#15,"B-P:"5;BP
660 PRINT#5,DF$(C1+X);
670 NEXT:PRINT#15,"U2";5;0;TT;SS:RETURN
680 IFER<>30THENPRINT""ERR$(ER)" ERROR IN LINE"EL:END
690 GRAPHIC1:CHAR1,4,10,"QUIT TO BASIC : ARE YOU SURE?"
700 GETKEYZ$:IFZ$="N"THENGRAPHIC0:RESUME
710 IFZ$<>"Y"THEN700
720 GRAPHIC0:PRINT""CHR$(9)
730 CLOSE5:CLOSE15:GRAPHIC1,1:SYS62364:SYS64756:GRAPHIC0,1:END
740 IFER=30THENRESUME:ELSESCNCLR:PRINTDS$:PRINTERR$(ER)" IN"EL
750 PRINT#15,"U1:"5;0;TT;SS
760 GET#5,A$:TT=ASC(A$):GET#5,A$:SS=ASC(A$)
770 FORT=0TO7:FORU=0TO29:GET#5,A$:IFA$=""THENA$=CHR$(0)
780 DF$(C)=DF$(C)+A$
790 NEXT:IFT<7THENGET#5,A$:GET#5,A$
800 IFASC(MID$(DF$(C),2,1))<>0THENLF=C
810 C=C+1:NEXT
820 RETURN
830 PR$="FILE TO SCRATCH":GOSUB1910
840 IFT<>1000THENPRINT"FILE NOT FOUND":ELSE860
850 PRINT"PRESS A KEY":GETKEYA$:RETURN
860 MID$(DF$(J),1,1)=CHR$(0):RETURN
870 PR$="FILE TO UNSCRATCH":GOSUB1910
880 IFT<>1000THENPRINT"FILE NOT FOUND":ELSE900
890 PRINT"PRESS A KEY":GETKEYA$:RETURN
900 PRINT"1-SEQ"
910 PRINT"2-PRG"
920 PRINT"3-USR"
930 PRINT"4-REL"
940 PRINT"FILE TYPE"ES$"Q";:INPUTA$:FT=VAL(A$)
950 IFFT<1ORFT>4ORFT<>INT(FT)THEN940
960 MID$(DF$(J),1,1)=CHR$(128+FT)
970 RETURN
980 PR$="FILE TO UNSPLAT":GOSUB1910
990 IFT<>1000THENPRINT"FILE NOT FOUND":ELSE1010
1000 PRINT"PRESS A KEY":GETKEYA$:RETURN
1010 A=ASC(DF$(J))OR128
1020 MID$(DF$(J),1,1)=CHR$(A)
1030 RETURN
1040 PR$="FILE TO LOCK":GOTO1060
1050 PR$="FILE TO UNLOCK"
1060 LL=VAL(A$):GOSUB1910
1070 IFT<>1000THENPRINT"FILE NOT FOUND":ELSE1090
1080 PRINT"PRESS A KEY":GETKEYA$:RETURN
1090 A=ASC(DF$(J))OR64:IFLL=6THENA=AAND191
1100 MID$(DF$(J),1,1)=CHR$(A)
1110 RETURN
1120 PR$="FILE TO RENAME":GOSUB1910
1130 IFT<>1000THENPRINT"FILE NOT FOUND":ELSE1150
1140 PRINT"PRESS A KEY":GETKEYA$:RETURN
1150 PRINT"OLD NAME : "MID$(DF$(J),4,16)
1160 PRINT"NEW NAME : "ES$"Q";:INPUTFF$
1170 IFFF$=""ORFF$="*"ORFF$="?"THEN1160
1180 IFLEN(FF$)<16THENFF$=FF$+CHR$(160):GOTO1180
1190 MID$(DF$(J),4,16)=FF$
1200 RETURN
1210 PRINT"ALPHANUMERIC SORT"
1220 PRINT"ARE YOU SURE"ES$"Q";:INPUTA$
1230 IFLEFT$(A$,1)="Y"THEN1250
1240 IFLEFT$(A$,1)="N"THENRETURN:ELSE1220
1250 PRINT"SORT BY FILE TYPE"ES$"Q";:INPUTA$
1260 IFLEFT$(A$,1)="N"THENGOTO1280
1270 IFLEFT$(A$,1)="Y"THENGOTO1380:ELSEGOTO1250
1280 PRINT"SORTING FILES"
```

```
1290 PRINT"PLEASE
 WAIT"
1300 FORT=C-1TO1STEP-1
1310 FORY=1TOT
1320 IFASC(MID$(DF$(Y),2,1))=OTH
EN1370
1330 F1$=CHR$(ABS((ASC(DF$(Y-1))
AND7)=0))
1340 F2$=CHR$(ABS((ASC(DF$(Y))AN
D7)=0))
1350 IFF1$+MID$(DF$(Y-1),4,16)<F
2$+MID$(DF$(Y),4,16)THEN1370
1360 XX$=DF$(Y-1):DF$(Y-1)=DF$(Y
):DF$(Y)=XX$
1370 NEXT:NEXT:RETURN
1380 PRINT"S
ORTING FILES"
1390 PRINT"PLEASE
 WAIT":SO$="24130"
1400 FORT=C-1TO1STEP-1
1410 FORY=1TOT
1420 IFASC(MID$(DF$(Y),2,1))=OTH
EN1460
1430 F1$=CHR$(4-(ASC(DF$(Y-1))AN
D7))+MID$(DF$(Y-1),4,16)
1440 F2$=CHR$(4-(ASC(DF$(Y))AND7
))+MID$(DF$(Y),4,16)
1450 IFF1$>F2$THENXX$=DF$(Y-1):D
F$(Y-1)=DF$(Y):DF$(Y)=XX$
1460 NEXT:NEXT:RETURN
1470 PRINT""N$" "ID$:PRINTES
$"T";
1480 PRINTSPC(27)"┌──────────┐"
1490 PRINTSPC(27)"│SPACE:    │"
1500 PRINTSPC(27)"│ADD SPACE │"
1510 PRINTSPC(27)"│          │"
1520 PRINTSPC(27)"│RETURN:   │"
1530 PRINTSPC(27)"│MOVE FILE │"
1540 PRINTSPC(27)"│          │"
1550 PRINTSPC(27)"│CRSR U/D: │"
1560 PRINTSPC(27)"│MOVE DIR- │"
1570 PRINTSPC(27)"│ECTORY    │"
1580 PRINTSPC(1)">"SPC(25)"│
 │"
1590 PRINTSPC(27)"│ESC:      │"
1600 PRINTSPC(27)"│MENU      │"
1610 PRINTSPC(27)"│          │"
1620 PRINTSPC(27)"│F1:       │"
1630 PRINTSPC(27)"│STORE FILE│"
1640 PRINTSPC(27)"│NAME      │"
1650 PRINTSPC(27)"└──────────┘"
1660 PRINT""ES$"T
"ES$"B"
1670 PRINT"";
1680 FORT=0TO9:PRINT:W=T:GOSUB20
:NEXT:FP=0:KEY1,CHR$(133)
1690 GETKEYA$:I=INSTR(" "+CHR$
(13)+CHR$(133)+CHR$(27),A$):IFI=
OTHEN1690
1700 ONIGOTO1710,1730,1760,1800,
1870,1890
1710 IFFP<LFTHENFP=FP+1:PRINTES$
"V"BO$;:W=FP+9:GOSUB20
1720 GOTO1690
1730 IFFP>OTHENFP=FP-1:PRINTES$"
W";
1740 IFFP>8THENW=FP-9:GOSUB20
1750 GOTO1690
1760 IFSP=OTHENPRINTPO$ES$"I
";:SP=1:ELSE1690
1770 FORT=LF+1TOFP+1STEP-1
1780 DF$(T)=DF$(T-1)
1790 NEXT:DF$(FP)="
 ":SN=FP:LF=LF+1:GOTO1690
1800 IFSP=OTHEN1690:ELSEDF$(SN)=
DF$(FP):SP=0
1810 IFABS(FP-SN)>9THEN1840
1820 PRINT"";:IFFP-SN<>9THENFOR
T=1TOSN-FP+9:PRINT"";:NEXT
1830 W=FP:GOSUB20
1840 PRINTPO$ES$"D";
1850 IFFP<LFTHENW=FP+10:GOSUB20
1860 FORT=FPTOLF:DF$(T)=DF$(T+1)
:NEXT:LF=LF-1:GOTO1690
1870 B$=MID$(DF$(FP),4,16):I=INS
TR(B$,CHR$(160)):IFI=OTHEN1690
1880 KEY1,LEFT$(B$,I-1):GOTO1690
1890 PRINT""ES$"T":IFSP=OT
HEN400
1900 FORT=SNTOLF:DF$(T)=DF$(T+1)
:NEXT:LF=LF-1:SP=0:RETURN
1910 PRINT""
1920 PRINTPR$ES$"Q";:FL$=""
1930 INPUTFL$:IFFL$=""ORLEN(FL$)
>16THEN1920
1940 IFINSTR(FL$,"*")=OTHEN1970
1950 IFINSTR(FL$,"*")<>LEN(FL$)T
HEN1920
1960 FL$=LEFT$(FL$,LEN(FL$)-1):G
OTO1980
1970 IFLEN(FL$)<16THENFL$=FL$+CH
R$(160):GOTO1970
1980 QM=0:IFINSTR(FL$,"?")<>OTHE
NQM=1:GOSUB2030
1990 FORT=OTOC:XX$=MID$(DF$(T),4
,16)
2000 IFQM=1THENFORY=OTOQC-1:MID$
(XX$,Q(Y),1)="?":NEXT
2010 IFLEFT$(XX$,LEN(FL$))=FL$TH
ENJ=T:T=999
2020 NEXT:RETURN
2030 K=0:QC=0
2040 DO:K=INSTR(FL$,"?",K+1):IFK
<>OTHENQ(QC)=K:QC=QC+1
2050 LOOPUNTILK=0
2060 RETURN
2070 N=ASC(DF$(W)):FT=NAND7:SL=N
AND128:LK=NAND64
2080 IFSL=0ANDFT<>OTHENSL$="*":E
LSESL$=" "
2090 IFLKTHENLK$="<":ELSELK$=" "
2100 PRINTCHR$(34)MID$(DF$(W),4,
16)CHR$(34)" "SL$FT$(FT)LK$;
2110 RETURN
```

## Double Height



PROGRAM: DBL HEIGHT CHARACTER

```
1A  0 POKE52,48:POKE56,48:CLR
C5  1 DATA169,0,141,32,208,141,3
    3,208,162,0,189,0,67,224,43,
    240,7,232,32,210,255,76
3B  2 DATA10,64,162,0,142,14,220
    ,169,51,133,1,189,0,208,157,
    0,48,224,255,240,4,232
13  3 DATA76,33,64,162,0,189,0,2
    09,157,0,49,224,255,240,4,23
    2,76,49,64,96,169,147
FE  4 DATA32,210,255,169,19,32,2
    10,255,169,7,162,0,157,0,216
    ,224,64,240,4,232,76,78
32  5 DATA64,169,3,162,0,157,40,
    216,224,64,240,4,232,76,93,6
    4,169,29,141,24,208,162
49  6 DATA0,189,49,67,157,4,4,28
    4,28,240,4,232,76,111,64,162
    ,0,189,85,67,157,44,4
E4  7 DATA224,28,240,4,232,76,12
    7,64,169,17,32,210,255,32,21
    0,255,162,0,169,255,157
2F  8 DATA0,53,224,8,240,4,232,7
    6,153,64,162,0,189,114,67,32
    ,210,255,224,35,240,5
7F  9 DATA232,76,166,64,234,165,
    197,201,56,240,9,201,27,208,
    246,169,8,76,198,64,169
7C  10 DATA1,141,213,64,169,15,1
    62,150,160,67,32,189,255,169
    ,1,162,8,160,1,32,186
35  11 DATA255,169,0,141,251,0,1
    69,48,141,252,0,162,0,160,52
    ,169,251,234,32,216,255
C8  12 DATA96,0,147,19,5,80,76,6
    9,65,83,69,32,87,65,73,84,32
    ,87,72,73,76,69,32,67
44  13 DATA72,65,82,65,67,84,69,
    82,83,32,65,82,69,32,67,79,8
    0,73,69,68,32,32,32,32
7E  14 DATA32,32,32,68,79,85,66,
    76,69,32,72,69,73,71,72,84,3
    2,66,89,32,67,76,73,86
B6  15 DATA69,32,72,79,82,78,69,
    82,112,127,124,108,113,123,1
    01,108,121,120,127,118
75  16 DATA113,32,116,113,98,101
    ,116,99,32,127,119,32,124,11
    8,98,126,113,32,116,121
EB  17 DATA114,106,113,114,17,17
    ,83,65,86,69,32,67,72,65,82,
    83,32,84,79,32,40,49
3C  18 DATA41,45,84,65,80,69,32,
    79,82,32,40,56,41,45,68,73,8
    3,67,68,66,76,32,72,69
1D  19 DATA73,71,72,84,32,67,72,
    65,82,83,32,255
55  20 DATA100,112,127,124,108,1
    13,123,101,116,98,117,97,118
    ,103,106,121,111,107
0E  21 DATA114,110,99,120,126,11
    5,125,119,109,-1
DB  22 POKE646,1:PRINTCHR$(147);
    CHR$(19);"PLEASE WAIT READIN
    G IN DATA"
9D  23 FORAD=16384TO16624:READMC
    :POKEAD,MC:CO=CO+MC:NEXT
1D  24 IFCO<>29097THENPRINT"ERRO
    R IN DATA":END
4B  25 CO=0
DC  26 FORAD=17152TO17319:READMC
    :POKEAD,MC:CO=CO+MC:NEXT
F9  27 IFCO<>12373THENPRINT"ERRO
    R IN DATA":END
B4  28 SYS16384
2A  29 FORA=53248TO53248+208STEP
    8
F5  30 FORQ=ATOA+3
6C  31 FORY=OTO1:POKE 12800+Y+Z,
    PEEK(Q):NEXTY:Z=Z+2:NEXTQ:NE
    XTA
F3  32 FORA=53252TO53252+208 STE
    P8
5E  33 READM:IFM=-1THEN37
1A  34 Z=0
00  35 FORQ=ATOA+3
B3  36 FORY=OTO1:POKE(M*8+12288)
    +Y+Z,PEEK(Q):NEXTY:Z=Z+2:NEX
    TQ:NEXTA
31  37 POKE1,55
79  38 POKE56334,1
5C  39 SYS16448
```

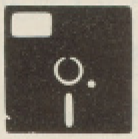
PROGRAM: DBL CHARACTER DEMO

```
7B  2 REM****DEMO****MAKE SURE D
    OUBLE CHARACTER PROGRAM HAS
    BEING EXECUTED FIRST**
8C  3 REM
A9  5 POKE52,48:POKE56,48
57  10 A=A+1
27  20 IFA=1THENLOAD"DBL HEIGHT
    CHAR",8,1
```

```
E9  22 POKE53272,29
1E  30 POKE53280,0:POKE53281,0:P
    RINT"[CLR,HOME]"
14  40 POKE646,2:PRINT"[SD,SE,SM
    ,SO] [SS,SH,SO,SW,SI,SN,SG]
    [SD,SO,SU,SB,SL,SE] [SH,SE,S
    I,SG,SH,ST] [SC,SH,SA,SR,SA,
    SC,ST,SE,SR,SS]"
9B  50 POKE646,7:PRINT"[CD,CE,CM
    ,CO] [CS,CH,CO,CW,CI,CN,CG]
    [CD,CO,CU,CB,CL,CE] [CH,CE,C
    I,CG,CH,CT] [CC,CH,CA,CR,CA,
    CC,CI,CE,CR,CS]"
D2  60 POKE646,10:PRINT"[SI,ST]
    [SC,SA,SN] [SE,SA,SS,SI,SL,S
    Y] [SB,SE] [SU,SS,SE,SD] [SI
    ,SN] [SY,SO,SU,SR] [SP,SR,SO
    ,SG,SR,SA,SM,SS]"
1F  70 POKE646,3:PRINT"[CI,CT] [
    CC,CA,CN] [CE,CA,CS,CI,CL,CY
    ] [CB,CE] [CU,CS,CE,CD] [CI,
    CN] [CY,CO,CU,CR] [CP,CR,CO,
    CG,CR,CA,CM,CS]"
DF  80 POKE646,13:PRINT"[SA,SS]
    [SS,SH,SO,SW,SN] [SB,SY] [ST
    ,SH,SI,SS] [SD,SE,SM,SO] [SW
    ,SH,SI,SC,SH] [SL,SO2,SK,SS]
     [SG,SR,SE,SA,ST]"
D6  90 POKE646,14:PRINT"[CA,CS]
    [CS,CH,CO,CW,CN] [CB,CY] [CT
    ,CH,CI,CS] [CD,CE,CM,CO] [CW
    ,CH,CI,CC,CH] [CL,CO2,CK,CS]
     [CG,CR,CE,CA,CT]"
5C  100 GOTO 100
```

# Listings

## Program Protection



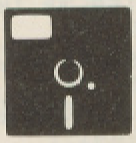
PROGRAM: INPUT BUFFER

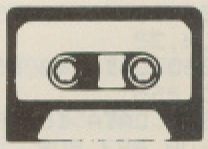
```
AF  10 REM**************************
    ***********
28  20 REM* CHAINING PROGRAMS US
    ING THE   *
0D  30 REM*         INPUT BUFFER
              *
99  32 REM**************************
    ***********
65  40 REM* REPLACE "FILENAME" W
    ITH THE    *
77  50 REM* NAME OF THE PROGRAM
    YOU NEED   *
E6  51 REM**************************
    ***********
88  60 REM* WHEN LOADING, CALL T
    HIS LOADER*
8F  70 REM* FIRST
              *
F2  71 REM**************************
    ***********
29  80 REM* THIS LOADER CAN BE I
    MPROVED    *
C2  90 REM* WITH SOME OF THE PRO
    TECTION    *
F6  91 REM* METHODS IN THE ARTIC
    LE         *
F0  92 REM* USE THE AUTORUN PROG
    RAM TO     *
4B  93 REM* MAKE THIS LOADER AUT
    ORUN,      *
47  94 REM* INSTALLING THE PROTE
    CTION FOR *
2C  95 REM* YOUR MAIN PROGRAM
              *
D9  96 REM**************************
    ***********
5C  97 REM* DELETE ALL THE REMS
    BEFORE USE*
17  98 REM**************************
    ***********
AE  99 REM MAIN PROGRAM STARTS H
    ERE
D8  100 CLR:REM CLEARS VARIABLES
A1  110 NAME$="LOAD"+CHR$(34)+"F
    ILENAME"+CHR$(34)+",8,1"+CHR
    $(0)
29  120 REM SETS UP STRING FOR I
    NPUT
A8  130 FOR J-1TOLEN(NAME$):POKE
    511+J,ASC(MID$(NAME$,J)):NEX
    TJ
DF  140 REM POKES THE STRING INT
    O THE INPUT      BUFFER AT 51
    2
AE  150 POKE198,3:POKE631,82:POK
    E632,213:POKE633,13
AD  160 REM PUTS RUN(R SHIFTED U
    ) AND RETURN      INTO KEYBOAR
    D BUFFER
AE  170 REM SETS QUEUE (198)-3 K
    EYPRESSES
F2  180 POKE781,255:POKE782,1
FC  190 REM SETS POINTER FOR INP
    UT TO POINT      TO 512
10  200 SYS42118
07  210 REM CALLS ROM ROUTINE TO
     INPUT LINE,      SIMULATING K
    EYBOARD ENTRY
```

PROGRAM: AUTORUN CREATE

```
AF  10 REM**************************
    ***********
94  20 REM*      AUTOSTART PROGRAM
              *
EB  30 REM* PLACES AUTOSTART PRO
    GRAM ON     *
C9  40 REM*      DISK UNDER NEW NA
    ME          *
E7  50 REM**************************
    ***********
2B  60 REM* LOAD NEW PROGRAM WIT
    H           *
31  70 REM*      LOAD"FILENAME",8,
    1           *
C9  80 REM**************************
    ***********
01  85 REM* THE PROGRAM IS SLOW
    IN BASIC   *
AD  90 REM* USE C-ZAP COMPILER T
    O SPEED UP*
FA  95 REM**************************
    ***********
21  100 PRINT"[CLR,WHITE]MESSAGE
     TO PUT BEFORE PROGRAM"
EC  110 INPUTMESSAGE$
4D  120 INPUT"[DOWN]NAME OF ORIG
    INAL PROGRAM";NAME$
F5  130 INPUT"[DOWN]NAME OF AUTO
    RUN PROGRAM";BOOT$
D1  140 PRINT"PLACE DISK IN DRIV
    E WITH ORIGINAL[SPC7]PROGRAM
    "
1B  150 PRINT"[DOWN]MAKE SURE TH
    AT THERE IS ROOM FOR THE NEW
    AUTOBOOT PROGRAM[DOWN]"
52  160 PRINT"PRESS RETURN"
53  170 GETA$:IFA$-""THEN170
3E  180 PRINT"[CLR,DOWN2]":PRINT
     MESSAGE$
4B  200 OPEN15,8,15,"INITIALIZE"
6A  210 OPEN1,8,3,NAME$+",P,R"
2C  220 OPEN2,8,4,BOOT$+",P,W"
BA  230 FORQ=677TO9999
B1  240 READX:IFX<0THEN300
2C  250 PRINT#2,CHR$(X);:NEXTQ
24  300 FORW-QTO2048
91  310 IFW=808THENPRINT#2,CHR$(
    234);:NEXTW
A6  320 IFW=770THENPRINT#2,CHR$(
    167);:NEXTW
65  330 IFW=771THENPRINT#2,CHR$(
    2);:NEXTW
07  340 PRINT#2,CHR$(PEEK(W));:N
    EXTW
02  400 GET#1,T$,T$
56  410 GET#1,T$:S-ST
DB  420 PRINT#2,CHR$(ASC(T$+CHR$
    (0)));
76  430 IF S-64 THEN CLOSE1:CLOS
    E2:CLOSE15:PRINT"SUCCESSFUL
    AUTORUN":END
85  440 GOTO410
75  500 DATA167,2,169,131,141,2,
    3,169,164,141
EE  510 DATA3,3,169,1,133,43,169
    ,8,133,44,169
77  520 DATA0,168,153,0,216,136,
    208,250,169
FC  530 DATA1,141,33,208,133,162
    ,165,162,208,252
51  540 DATA169,234,141,40,3,32,
    89,166,76,174,167,-1
```

## Sprite Controller





PROGRAM: SPRITE PROGRAMMER CODE

```
42  10 I-16384
2E  20 READ A:IF A-256 THEN END
57  30 POKE I,A:I-I+1:GOTO 20
B5  16384 DATA 162,4,160,5,24,32
    ,240,255
7B  16392 DATA 169,32,160,64,32,
    30,171,96
3A  16400 DATA 169,48,141,28,4,1
    69,45,141
50  16408 DATA 29,4,169,55,141,3
```

```
0,4,96
DA 16416 DATA 83,80,82,73,84,69,32,80
4D 16424 DATA 82,79,71,82,65,77,77,69
27 16432 DATA 82,32,66,89,32,65,76,65
FD 16440 DATA 78,32,79,66,69,69,0,0
BB 16448 DATA 160,0,185,0,80,153,0,4
6E 16456 DATA 185,0,81,153,0,5,185,0
97 16464 DATA 82,153,0,6,185,248,82,153
19 16472 DATA 248,6,136,208,229,32,176,64
A2 16480 DATA 96,160,0,185,0,84,153,0
8E 16488 DATA 4,185,0,85,153,0,5,185
26 16496 DATA 0,86,153,0,6,185,248,86
7C 16504 DATA 153,248,6,136,208,229,32,176
FC 16512 DATA 64,96,160,0,185,0,88,153
CC 16520 DATA 0,4,185,0,89,153,0,5
C3 16528 DATA 185,0,90,153,0,6,185,248
DF 16536 DATA 90,153,248,6,136,208,229,32
C5 16544 DATA 176,64,96,0,0,54,0,0
7E 16552 DATA 1,0,0,0,0,0,0,0
A6 16560 DATA 160,0,169,1,153,0,216,153
8B 16568 DATA 0,218,153,0,217,153,248,218
F4 16576 DATA 136,208,239,96,120,169,209,141
08 16584 DATA 20,3,169,64,141,21,3,88
DA 16592 DATA 96,32,159,255,166,198,240,12
A7 16600 DATA 202,189,119,2,201,137,240,7
E5 16608 DATA 201,138,240,9,76,49,234,238
DF 16616 DATA 32,208,76,187,65,238,33,208
05 16624 DATA 76,187,65,160,0,32,228,255
09 16632 DATA 240,251,201,3,240,18,201,13
D2 16640 DATA 240,14,200,192,3,240,238,32
02 16648 DATA 210,255,153,0,66,76,245,64
94 16656 DATA 96,255,0,255,0,169,1,141
E4 16664 DATA 32,216,169,160,141,33,4,32
69 16672 DATA 48,65,169,32,141,33,4,32
72 16680 DATA 48,65,96,2,134,246,0,255
65 16688 DATA 162,64,160,144,136,208,253,202
B3 16696 DATA 208,248,96,255,0,105,0,255
AE 16704 DATA 169,13,141,41,216,141,43,216
5E 16712 DATA 141,45,216,141,57,216,141,58
FF 16720 DATA 216,141,59,216,141,60,216,141
AF 16728 DATA 61,216,141,56,216,141,193,219
19 16736 DATA 141,194,219,141,212,219,141,213
4D 16744 DATA 219,96,169,13,141,26,217,141
EA 16752 DATA 50,218,96,75,173,167,64,73
7D 16760 DATA 1,141,168,64,96,255,0,255
34 16768 DATA 160,131,140,1,208,140,3,208
20 16776 DATA 140,5,208,140,7,208,140,9
9D 16784 DATA 208,140,11,208,140,13,208,140
13 16792 DATA 15,208,234,234,160,0,169,33
0F 16800 DATA 153,0,208,200,200,105,39,192
3F 16808 DATA 12,208,245,169,192,141,16,208
A9 16816 DATA 169,16,141,12,208,169,56,141
84 16824 DATA 14,208,96,32,48,65,169,0
CD 16832 DATA 133,198,76,49,234,173,170,64
47 16840 DATA 10,141,170,64,32,158,66,234
24 16848 DATA 32,228,255,240,251,201,145,240
BF 16856 DATA 39,201,17,240,19,201,157,240
1D 16864 DATA 95,201,29,240,59,201,13,240
0A 16872 DATA 3,76,48,67,32,96,66,96
01 16880 DATA 172,170,64,24,185,1,208,170
CF 16888 DATA 232,138,153,1,208,76,208,65
E5 16896 DATA 172,170,64,234,185,1,208,170
1F 16904 DATA 202,138,153,1,208,76,208,65
1D 16912 DATA 172,170,64,185,0,208,170,202
9B 16920 DATA 138,153,0,208,76,208,65,234
54 16928 DATA 172,170,64,185,0,208,201,255
F6 16936 DATA 240,9,170,232,138,153,0,208
23 16944 DATA 76,208,65,32,133,66,169,0
03 16952 DATA 141,172,64,76,208,65,0,255
61 16960 DATA 76,184,66,66,67,68,69,255
8B 16968 DATA 0,255,73,255,0,76,0,78
9F 16976 DATA 162,1,160,1,136,208,253,202
5A 16984 DATA 208,248,96,255,0,255,0,255
66 16992 DATA 172,170,64,185,0,208,153,0
D1 17000 DATA 68,185,1,208,153,1,68,96
A1 17008 DATA 173,170,64,10,141,171,64,96
90 17016 DATA 160,0,169,160,153,0,68,200
3E 17024 DATA 192,17,208,246,96,173,173,64
6E 17032 DATA 101,250,233,0,141,16,208,133
59 17040 DATA 250,169,0,172,170,64,153,0
80 17048 DATA 208,96,96,255,0,255,160,0
19 17056 DATA 185,0,68,153,0,208,185,1
C9 17064 DATA 68,153,1,208,200,234,192,16
A7 17072 DATA 208,238,165,250,141,16,208,96
7F 17080 DATA 165,250,201,1,176,3,76,16
E4 17088 DATA 66,172,170,64,185,0,208,201
97 17096 DATA 0,240,3,76,16,66,165,250
95 17104 DATA 234,37,251,141,16,208,133,250
6E 17112 DATA 172,170,64,169,255,153,0,208
48 17120 DATA 76,208,65,76,208,65,0,32
E7 17128 DATA 253,174,32,212,225,32,253,174
1F 17136 DATA 32,138,173,32,247,183,165,20
7E 17144 DATA 72,165,21,72,32,253,174,32
95 17152 DATA 138,173,32,247,183,166,20,164
F0 17160 DATA 21,104,133,252,104,133,251,169
0E 17168 DATA 251,76,95,225,165,250,229,251
31 17176 DATA 133,251,96,208,65,255,0,255
14 17184 DATA 120,169,49,141,20,3,169,234
7B 17192 DATA 141,21,3,88,96,246,0,255
5B 17200 DATA 201,140,240,12,76,208,65,255
FA 17208 DATA 0,255,0,255,0,105,0,255
B9 17216 DATA 160,0,185,0,128,153,0,4
FA 17224 DATA 185,0,129,153,0,5,185,0
0C 17232 DATA 130,153,0,6,185,248,130,153
01 17240 DATA 248,6,136,208,229,76,208,65
14 17248 DATA 0,255,0,255,0,255,0,255
1C 17256 DATA 0,255,0,255,0,255,0,255
24 17264 DATA 0,255,0,255,0,255,0,255
2C 17272 DATA 0,255,0,255,0,255,0,255
34 17280 DATA 0,255,0,255,0,255,0,255
3C 17288 DATA 0,255,0,255,0,255,0,255
44 17296 DATA 0,255,0,255,0,255,0,255
4C 17304 DATA 0,255,0,255,0,255,0,255
54 17312 DATA 0,255,0,255,0,255,0,255
5C 17320 DATA 0,255,0,255,0,255,0,255
64 17328 DATA 0,255,0,255,0,255,0,255
6C 17336 DATA 0,255,0,255,0,255,0,255
74 17344 DATA 0,255,0,255,0,255,0,255
7C 17352 DATA 0,255,0,255,0,255,0,255
84 17360 DATA 0,255,0,255,0,255,0,255
8C 17368 DATA 0,255,0,255,0,255,0,255
C2 17376 DATA 71,87,46,76,73,68,13,73
CE 17384 DATA 76,69,78,65,77,69,32,255
A4 17392 DATA 0,255,0,255,0,255,0,255
AC 17400 DATA 0,255,0,255,0,255,0,255
6B 17408 DATA 160,160,160,160,160,160,160,160
```

```
73 17416 DATA 160,160,160,160,160,160,160,160
30 17424 DATA 160,255,0,255,0,255,0,255
33 17432 DATA 0,255,0,255,0,255,0,255
5E 17440 DATA 160,0,32,207,255,192,15,240
5A 17448 DATA 4,153,224,67,200,201,13,208
8C 17456 DATA 241,132,252,169,1,166,253,160
9C 17464 DATA 1,32,186,255,165,252,162,224
CF 17472 DATA 160,67,32,189,255,169,0,32
16 17480 DATA 213,255,96,45,132,46,96,255
E1 17488 DATA 65,76,65,78,81,81,81,81
FD 17496 DATA 81,81,81,81,81,81,81,65
F2 17504 DATA 0,255,0,255,0,169,147,32
80 17512 DATA 210,255,169,48,133,252,169,2
B5 17520 DATA 133,253,169,0,133,144,169,36
4F 17528 DATA 133,251,169,251,133,187,169,0
A2 17536 DATA 133,188,165,253,133,183,169,8
40 17544 DATA 133,186,169,96,133,185,32,213
E7 17552 DATA 243,165,186,32,180,255,165,185
A0 17560 DATA 32,150,255,164,144,208,61,160
3C 17568 DATA 6,132,251,32,165,255,166,252
E0 17576 DATA 133,252,164,144,208,46.164.251
84 17584 DATA 136,208,238,164,252,32,205,189
11 17592 DATA 169,32,32,210,255,32,165,255
3F 17600 DATA 166,144,208,65,170,240,6,32
F2 17608 DATA 210,255,76,189,68,169,13,32
23 17616 DATA 210,255,165,197,201,63,240,4
C0 17624 DATA 160,4,208,197,32,66,246,169
C7 17632 DATA 13,32,210,255,169,0,133,144
CD 17640 DATA 169,8,133,186,32,180,255,169
48 17648 DATA 111,133,185,32,150,255,164,144
E7 17656 DATA 208,10,32,165,255,32,210,255
20 17664 DATA 201,13,208,242,32,171,255,96
A2 17672 DATA 0,255,0,255,0,255,0,255
E3 17680 DATA 32,207,255,201,13,240,25,201
03 17688 DATA 30,240,21,201,31,240,49,76
EF 17696 DATA 16,69,96,255,0,76,80,69
D5 17704 DATA 0,255,0,255,146,246,0,255
E9 17712 DATA 160,0,185,0,4,153,0,70
FA 17720 DATA 185,0,5,153,0,71,185,0
59 17728 DATA 6,153,0,72,185,248,6,153
55 17736 DATA 248,72,136,208,229,96,16,69
15 17744 DATA 160,0,185,0,70,153,0,4
9C 17752 DATA 185,0,71,153,0,5,185,0
D4 17760 DATA 72,153,0,6,185,248,72,153
C2 17768 DATA 248,6,136,208,229,96,16,69
4A 17776 DATA 0,255,0,255,0,255,0,255
12 17784 DATA 0,255,0,255,0,255,0,255
5A 17792 DATA 0,255,0,255,0,255,0,255
22 17800 DATA 0,255,0,255,0,255,0,255
6A 17808 DATA 0,255,0,255,0,255,0,255
B2 17816 DATA 0,255,0,255,0,255,0,255
7A 17824 DATA 0,255,0,255,0,255,0,255
C2 17832 DATA 0,255,0,255,0,255,0,255
8A 17840 DATA 0,255,0,255,0,255,0,255
52 17848 DATA 0,255,0,255,0,255,0,255
9A 17856 DATA 0,255,0,255,0,255,0,255
62 17864 DATA 0,255,0,255,0,255,0,255
AA 17872 DATA 0,255,0,255,0,255,0,255
F2 17880 DATA 0,255,0,255,0,255,0,255
BA 17888 DATA 0,255,0,255,0,255,0,255
02 17896 DATA 0,255,0,255,0,255,0,255
CA 17904 DATA 0,255,0,255,0,255,0,255
92 17912 DATA 0,255,0,255,0,255,0,255
F9 17920 DATA 32,32,32,32,32,32,32,32
C2 17928 DATA 32,32,32,112,64,64,64,64
69 17936 DATA 64,64,64,64,64,64,64,64
A8 17944 DATA 64,64,110,32,32,32,32,32
19 17952 DATA 32,32,32,32,32,32,32,32
E1 17960 DATA 32,32,32,32,32,32,32,32
EA 17968 DATA 32,32,32,93,5,24,20,18
DE 17976 DATA 1,32,3,15,13,13,1,14
00 17984 DATA 4,19,93,32,32,32,32,32
01 17992 DATA 32,32,32,32,32,32,32,32
49 18000 DATA 32,32,32,32,32,32,32,32
BA 18008 DATA 32,32,32,109,64,64,64,64
B9 18016 DATA 64,64,64,64,64,64,64,64
1A 18024 DATA 64,64,125,32,32,32,32,32
69 18032 DATA 32,32,32,32,32,32,32,32
34 18040 DATA 32,32,32,32,112,64,110,32
79 18048 DATA 32,32,32,32,32,32,32,32
41 18056 DATA 32,32,32,32,32,32,32,32
89 18064 DATA 32,32,32,32,32,32,32,32
D1 18072 DATA 32,32,32,32,32,32,32,32
72 18080 DATA 32,32,32,32,93,147,93,32
FB 18088 DATA 32,32,58,32,19,1,22,5
8B 18096 DATA 32,22,1,18,9,1,2,12
62 18104 DATA 5,19,32,32,32,32,32,32
B9 18112 DATA 32,32,32,32,32,32,32,32
14 18120 DATA 32,32,32,32,109,64,125,32
C9 18128 DATA 32,32,32,32,32,32,32,32
11 18136 DATA 32,32,32,32,32,32,32,32
D9 18144 DATA 32,32,32,32,32,32,32,32
A1 18152 DATA 32,32,32,32,32,32,32,32
4C 18160 DATA 32,32,32,32,112,64,110,32
31 18168 DATA 32,32,32,32,32,32,32,32
E0 18176 DATA 32,32,32,32,32,32,32,32
08 18184 DATA 32,32,32,32,32,32,32,32
70 18192 DATA 32,32,32,32,32,32,32,32
10 18200 DATA 32,32,32,32,93,140,93,32
E4 18208 DATA 32,32,58,32,12,15,1,4
10 18216 DATA 32,22,1,18,9,1,2,12
E7 18224 DATA 5,19,32,32,32,32,32,32
38 18232 DATA 32,32,32,32,32,32,32,32
4F 18240 DATA 32,32,32,32,109,64,125,32
48 18248 DATA 32,32,32,32,32,32,32,32
B0 18256 DATA 32,32,32,32,32,32,32,32
58 18264 DATA 32,32,32,32,32,32,32,32
40 18272 DATA 32,32,32,32,32,32,32,32
43 18280 DATA 32,32,32,32,112,64,110,32
50 18288 DATA 32,32,32,32,32,32,32,32
78 18296 DATA 32,32,32,32,32,32,32,32
60 18304 DATA 32,32,32,32,32,32,32,32
88 18312 DATA 32,32,32,32,32,32,32,32
CF 18320 DATA 32,32,32,32,93,176,93,32
92 18328 DATA 32,32,58,32,13,21,12,20
CC 18336 DATA 9,45,3,15,12,15,21,18
BB 18344 DATA 32,48,32,61,32,32,32,32
90 18352 DATA 32,32,32,32,32,32,32,32
37 18360 DATA 32,32,32,32,109,64,125,32
A0 18368 DATA 32,32,32,32,32,32,32,32
C8 18376 DATA 32,32,32,32,32,32,32,32
30 18384 DATA 32,32,32,32,32,32,32,32
D8 18392 DATA 32,32,32,32,32,32,32,32
1B 18400 DATA 32,32,32,32,112,64,110,32
E8 18408 DATA 32,32,32,32,32,32,32,32
D0 18416 DATA 32,32,32,32,32,32,32,32
```

```
F8 18424 DATA 32,32,32,32,32,32,32,32
FF 18432 DATA 32,32,32,32,32,32,32,32
37 18440 DATA 32,32,32,32,93,177,93,32
0B 18448 DATA 32,32,58,32,13,21,12,20
FF 18456 DATA 9,45,3,15,12,15,21,18
09 18464 DATA 32,49,32,61,32,32,32,32
67 18472 DATA 32,32,32,32,32,32,32,32
1E 18480 DATA 32,32,32,32,109,64,125,32
F7 18488 DATA 32,32,32,32,32,32,32,32
3F 18496 DATA 32,32,32,32,32,32,32,32
B7 18504 DATA 32,32,32,32,32,32,32,32
4F 18512 DATA 32,32,32,32,32,32,32,32
8E 18520 DATA 32,32,32,32,112,64,110,32
5F 18528 DATA 32,32,32,32,32,32,32,32
A7 18536 DATA 32,32,32,32,32,32,32,32
6F 18544 DATA 32,32,32,32,32,32,32,32
37 18552 DATA 32,32,32,32,32,32,32,32
CA 18560 DATA 32,32,32,32,93,141,93,32
B5 18568 DATA 32,32,58,32,12,15,1,4
9A 18576 DATA 32,19,16,18,9,20,5,19
57 18584 DATA 32,32,32,32,32,32,32,32
9F 18592 DATA 32,32,32,32,32,32,32,32
66 18600 DATA 32,32,32,32,109,64,125,32
AF 18608 DATA 32,32,32,32,32,32,32,32
77 18616 DATA 32,32,32,32,32,32,32,32
BF 18624 DATA 32,32,32,32,32,32,32,32
07 18632 DATA 32,32,32,32,32,32,32,32
66 18640 DATA 32,32,32,32,112,64,110,32
97 18648 DATA 32,32,32,32,32,32,32,32
DF 18656 DATA 32,32,32,32,32,32,32,32
27 18664 DATA 32,32,32,32,32,32,32,32
EF 18672 DATA 32,32,32,32,32,32,32,32
F6 18680 DATA 32,32,32,32,93,132,93,32
59 18688 DATA 32,32,58,32,4,9,19,11
EF 18696 DATA 32,4,9,18,5,3,20,15
EA 18704 DATA 18,25,32,32,32,32,32,32
8E 18712 DATA 32,32,32,32,32,32,32,32
59 18720 DATA 32,32,32,32,109,64,125,32
5E 18728 DATA 32,32,32,32,32,32,32,32
26 18736 DATA 32,32,32,32,32,32,32,32
2E 18744 DATA 32,32,32,32,32,32,32,32
36 18752 DATA 32,32,32,32,32,32,32,32
80 18760 DATA 32,32,32,32,112,64,64,110
46 18768 DATA 32,32,32,32,32,32,32,32
CE 18776 DATA 32,32,32,32,32,32,32,32
56 18784 DATA 32,32,32,32,32,32,32,32
9E 18792 DATA 32,32,32,32,32,32,32,32
7E 18800 DATA 32,32,32,32,93,134,183,93
E4 18808 DATA 32,32,58,32,5,24,9,20
76 18816 DATA 32,32,32,32,32,32,32,32
3E 18824 DATA 32,32,32,32,32,32,32,32
86 18832 DATA 32,32,32,32,32,32,32,32
9B 18840 DATA 32,32,32,32,109,64,64,125
96 18848 DATA 32,32,32,32,32,32,32,32
DE 18856 DATA 32,32,32,32,32,32,32,32
A6 18864 DATA 32,32,32,32,32,32,32,32
AE 18872 DATA 32,32,32,32,32,32,32,32
B6 18880 DATA 32,32,32,32,32,32,32,32
7E 18888 DATA 32,32,32,32,32,32,32,32
C6 18896 DATA 32,32,32,32,32,32,32,32
4E 18904 DATA 32,32,32,32,32,32,32,32
D6 18912 DATA 32,32,32,32,32,32,32,32
67 18920 DATA 32,109,64,125,96,32,32,32
E6 18928 DATA 32,32,32,32,32,32,32,32
B6 18936 DATA 0,255,0,255,0,255,0,255
BD 18944 DATA 0,255,0,255,0,255,0,255
05 18952 DATA 0,255,0,255,0,255,0,255
CD 18960 DATA 0,255,0,255,0,255,0,255
15 18968 DATA 0,255,0,255,0,255,0,255
DD 18976 DATA 0,255,0,255,0,255,0,255
9B 18984 DATA 0,255,0,255,134,246,0,255
ED 18992 DATA 0,255,0,255,0,255,0,255
AD 19000 DATA 0,255,0,255,0,105,0,255
FD 19008 DATA 0,255,0,255,0,255,0,255
45 19016 DATA 0,255,0,255,0,255,0,255
0D 19024 DATA 0,255,0,255,0,255,0,255
55 19032 DATA 0,255,0,255,0,255,0,255
1D 19040 DATA 0,255,0,255,0,255,0,255
65 19048 DATA 0,255,0,255,0,255,0,255
2D 19056 DATA 0,255,0,255,0,255,0,255
75 19064 DATA 0,255,0,255,0,255,0,255
3D 19072 DATA 0,255,0,255,0,255,0,255
85 19080 DATA 0,255,0,255,0,255,0,255
4D 19088 DATA 0,255,0,255,0,255,0,255
95 19096 DATA 0,255,0,255,0,255,0,255
5D 19104 DATA 0,255,0,255,0,255,0,255
A5 19112 DATA 0,255,0,255,0,255,0,255
6D 19120 DATA 0,255,0,255,0,255,0,255
B5 19128 DATA 0,255,0,255,0,255,0,255
7D 19136 DATA 0,255,0,255,0,255,0,255
C5 19144 DATA 0,255,0,255,0,255,0,255
8D 19152 DATA 0,255,0,255,0,255,0,255
D5 19160 DATA 0,255,0,255,0,255,0,255
9D 19168 DATA 0,255,0,255,0,255,0,255
E5 19176 DATA 0,255,0,255,0,255,0,255
AD 19184 DATA 0,255,0,255,0,255,0,255
F5 19192 DATA 0,255,0,255,0,255,0,255
BC 19200 DATA 0,255,0,255,0,255,0,255
C4 19208 DATA 0,255,0,255,0,255,0,255
CC 19216 DATA 0,255,0,255,0,255,0,255
D4 19224 DATA 0,255,0,255,0,255,0,255
DC 19232 DATA 0,255,0,255,0,255,0,255
B8 19240 DATA 0,255,0,255,150,246,0,255
EC 19248 DATA 0,255,0,255,0,255,0,255
02 19256 DATA 0,255,0,255,0,105,0,255
FC 19264 DATA 0,255,0,255,0,255,0,255
04 19272 DATA 0,255,0,255,0,255,0,255
0C 19280 DATA 0,255,0,255,0,255,0,255
14 19288 DATA 0,255,0,255,0,255,0,255
1C 19296 DATA 0,255,0,255,0,255,0,255
24 19304 DATA 0,255,0,255,0,255,0,255
2C 19312 DATA 0,255,0,255,0,255,0,255
34 19320 DATA 0,255,0,255,0,255,0,255
3C 19328 DATA 0,255,0,255,0,255,0,255
44 19336 DATA 0,255,0,255,0,255,0,255
4C 19344 DATA 0,255,0,255,0,255,0,255
54 19352 DATA 0,255,0,255,0,255,0,255
5C 19360 DATA 0,255,0,255,0,255,0,255
64 19368 DATA 0,255,0,255,0,255,0,255
6C 19376 DATA 0,255,0,255,0,255,0,255
74 19384 DATA 0,255,0,255,0,255,0,255
7C 19392 DATA 0,255,0,255,0,255,0,255
84 19400 DATA 0,255,0,255,0,255,0,255
8C 19408 DATA 0,255,0,255,0,255,0,255
94 19416 DATA 0,255,0,255,0,255,0,255
9C 19424 DATA 0,255,0,255,0,255,0,255
```

```
A4 19432 DATA 0,255,0,255,0,255,0,255
AC 19440 DATA 0,255,0,255,0,255,0,255
B4 19448 DATA 0,255,0,255,0,255,0,255
A3 19456 DATA 0,255,0,255,0,255,0,255
EB 19464 DATA 0,255,0,255,0,255,0,255
33 19472 DATA 0,255,0,255,0,255,0,255
FB 19480 DATA 0,255,0,255,0,255,0,255
43 19488 DATA 0,255,0,255,0,255,0,255
1F 19496 DATA 0,255,0,255,150,246,0,255
D3 19504 DATA 0,255,0,255,0,255,0,255
E7 19512 DATA 0,255,0,255,0,105,0,255
E3 19520 DATA 0,255,0,255,0,255,0,255
2B 19528 DATA 0,255,0,255,0,255,0,255
73 19536 DATA 0,255,0,255,0,255,0,255
3B 19544 DATA 0,255,0,255,0,255,0,255
83 19552 DATA 0,255,0,255,0,255,0,255
4B 19560 DATA 0,255,0,255,0,255,0,255
13 19568 DATA 0,255,0,255,0,255,0,255
5B 19576 DATA 0,255,0,255,0,255,0,255
23 19584 DATA 0,255,0,255,0,255,0,255
6B 19592 DATA 0,255,0,255,0,255,0,255
B3 19600 DATA 0,255,0,255,0,255,0,255
7B 19608 DATA 0,255,0,255,0,255,0,255
C3 19616 DATA 0,255,0,255,0,255,0,255
8B 19624 DATA 0,255,0,255,0,255,0,255
53 19632 DATA 0,255,0,255,0,255,0,255
9B 19640 DATA 0,255,0,255,0,255,0,255
63 19648 DATA 0,255,0,255,0,255,0,255
AB 19656 DATA 0,255,0,255,0,255,0,255
F3 19664 DATA 0,255,0,255,0,255,0,255
BB 19672 DATA 0,255,0,255,0,255,0,255
03 19680 DATA 0,255,0,255,0,255,0,255
CB 19688 DATA 0,255,0,255,0,255,0,255
93 19696 DATA 0,255,0,255,0,255,0,255
DB 19704 DATA 0,255,0,255,0,255,0,255
A2 19712 DATA 0,255,0,255,0,255,0,255
EA 19720 DATA 0,255,0,255,0,255,0,255
32 19728 DATA 0,255,0,255,0,255,0,255
FA 19736 DATA 0,255,0,255,0,255,0,255
42 19744 DATA 0,255,0,255,0,255,0,255
19 19752 DATA 0,255,0,255,130,254,0,255
D2 19760 DATA 0,255,0,255,0,255,0,255
E4 19768 DATA 0,255,0,255,0,105,0,255
E2 19776 DATA 0,255,0,255,0,255,0,255
2A 19784 DATA 0,255,0,255,0,255,0,255
72 19792 DATA 0,255,0,255,0,255,0,255
3A 19800 DATA 0,255,0,255,0,255,0,255
82 19808 DATA 0,255,0,255,0,255,0,255
4A 19816 DATA 0,255,0,255,0,255,0,255
12 19824 DATA 0,255,0,255,0,255,0,255
5A 19832 DATA 0,255,0,255,0,255,0,255
22 19840 DATA 0,255,0,255,0,255,0,255
6A 19848 DATA 0,255,0,255,0,255,0,255
B2 19856 DATA 0,255,0,255,0,255,0,255
7A 19864 DATA 0,255,0,255,0,255,0,255
C2 19872 DATA 0,255,0,255,0,255,0,255
8A 19880 DATA 0,255,0,255,0,255,0,255
52 19888 DATA 0,255,0,255,0,255,0,255
9A 19896 DATA 0,255,0,255,0,255,0,255
62 19904 DATA 0,255,0,255,0,255,0,255
AA 19912 DATA 0,255,0,255,0,255,0,255
F2 19920 DATA 0,255,0,255,0,255,0,255
BA 19928 DATA 0,255,0,255,0,255,0,255
02 19936 DATA 0,255,0,255,0,255,0,255
CA 19944 DATA 0,255,0,255,0,255,0,255
92 19952 DATA 0,255,0,255,0,255,0,255
DA 19960 DATA 0,255,0,255,0,255,0,255
01 19968 DATA 0,255,0,255,0,255,0,255
C9 19976 DATA 0,255,0,255,0,255,0,255
11 19984 DATA 0,255,0,255,0,255,0,255
D9 19992 DATA 0,255,0,255,0,255,0,255
21 20000 DATA 0,255,0,255,0,255,0,255
29 20008 DATA 0,255,0,255,150,246,0,255
31 20016 DATA 0,255,0,255,0,255,0,255
B2 20024 DATA 0,255,0,255,0,41,0,255
41 20032 DATA 0,255,0,255,0,255,0,255
09 20040 DATA 0,255,0,255,0,255,0,255
51 20048 DATA 0,255,0,255,0,255,0,255
19 20056 DATA 0,255,0,255,0,255,0,255
61 20064 DATA 0,255,0,255,0,255,0,255
29 20072 DATA 0,255,0,255,0,255,0,255
71 20080 DATA 0,255,0,255,0,255,0,255
39 20088 DATA 0,255,0,255,0,255,0,255
81 20096 DATA 0,255,0,255,0,255,0,255
49 20104 DATA 0,255,0,255,0,255,0,255
91 20112 DATA 0,255,0,255,0,255,0,255
59 20120 DATA 0,255,0,255,0,255,0,255
A1 20128 DATA 0,255,0,255,0,255,0,255
69 20136 DATA 0,255,0,255,0,255,0,255
B1 20144 DATA 0,255,0,255,0,255,0,255
79 20152 DATA 0,255,0,255,0,255,0,255
C1 20160 DATA 0,255,0,255,0,255,0,255
89 20168 DATA 0,255,0,255,0,255,0,255
D1 20176 DATA 0,255,0,255,0,255,0,255
99 20184 DATA 0,255,0,255,0,255,0,255
E1 20192 DATA 0,255,0,255,0,255,0,255
A9 20200 DATA 0,255,0,255,0,255,0,255
F1 20208 DATA 0,255,0,255,0,255,0,255
B9 20216 DATA 0,255,0,255,0,255,0,255
A0 20224 DATA 0,255,0,255,0,255,0,255
E8 20232 DATA 0,255,0,255,0,255,0,255
30 20240 DATA 0,255,0,255,0,255,0,255
F8 20248 DATA 0,255,0,255,0,255,0,255
40 20256 DATA 0,255,0,255,0,255,0,255
19 20264 DATA 0,255,0,255,150,254,0,255
D0 20272 DATA 0,255,0,255,0,255,0,255
57 20280 DATA 0,255,0,255,0,41,0,255
E0 20288 DATA 0,255,0,255,0,255,0,255
28 20296 DATA 0,255,0,255,0,255,0,255
70 20304 DATA 0,255,0,255,0,255,0,255
38 20312 DATA 0,255,0,255,0,255,0,255
80 20320 DATA 0,255,0,255,0,255,0,255
48 20328 DATA 0,255,0,255,0,255,0,255
10 20336 DATA 0,255,0,255,0,255,0,255
58 20344 DATA 0,255,0,255,0,255,0,255
20 20352 DATA 0,255,0,255,0,255,0,255
68 20360 DATA 0,255,0,255,0,255,0,255
B0 20368 DATA 0,255,0,255,0,255,0,255
78 20376 DATA 0,255,0,255,0,255,0,255
C0 20384 DATA 0,255,0,255,0,255,0,255
88 20392 DATA 0,255,0,255,0,255,0,255
50 20400 DATA 0,255,0,255,0,255,0,255
98 20408 DATA 0,255,0,255,0,255,0,255
60 20416 DATA 0,255,0,255,0,255,0,255
A8 20424 DATA 0,255,0,255,0,255,0,255
F0 20432 DATA 0,255,0,255,0,255,0,255
```

```
B8 20440 DATA 0,255,0,255,0,255,0,255
00 20448 DATA 0,255,0,255,0,255,0,255
C8 20456 DATA 0,255,0,255,0,255,0,255
90 20464 DATA 0,255,0,255,0,255,0,255
2C 20472 DATA 0,255,0,255,0,255,112,64
6E 20480 DATA 112,64,64,64,64,64,110,32
3C 20488 DATA 32,32,32,32,32,32,32,112
76 20496 DATA 64,64,64,64,64,64,110,32
1F 20504 DATA 32,32,32,32,32,32,32,32
22 20512 DATA 62,32,32,32,32,32,32,32
BE 20520 DATA 93,133,47,152,47,153,93,32
FB 20528 DATA 32,32,32,32,32,32,32,93
FB 20536 DATA 144,129,135,133,160,177,93,32
87 20544 DATA 32,32,32,32,32,32,32,32
4F 20552 DATA 32,32,32,32,32,32,32,32
96 20560 DATA 109,64,64,64,64,64,125,32
94 20568 DATA 32,32,32,32,32,32,32,109
68 20576 DATA 64,64,64,64,64,64,125,32
6F 20584 DATA 32,32,32,32,32,32,32,32
37 20592 DATA 32,32,32,32,32,32,32,32
7F 20600 DATA 32,32,32,32,32,32,32,32
C7 20608 DATA 32,32,32,32,32,32,32,32
8F 20616 DATA 32,32,32,32,32,32,32,32
57 20624 DATA 32,32,32,32,32,32,32,32
9F 20632 DATA 32,32,32,32,32,32,32,32
E7 20640 DATA 32,32,32,32,32,32,32,32
AF 20648 DATA 32,32,32,32,32,32,32,32
77 20656 DATA 32,32,32,32,32,32,32,32
BF 20664 DATA 32,32,32,32,32,32,32,32
07 20672 DATA 32,32,32,32,32,32,32,32
CF 20680 DATA 32,32,32,32,32,32,32,32
C4 20688 DATA 32,32,32,32,32,32,32,112
D7 20696 DATA 64,114,64,114,64,114,64,114
BB 20704 DATA 64,114,64,114,64,114,64,110
EF 20712 DATA 32,32,32,32,32,32,32,32
D8 20720 DATA 32,112,64,110,32,32,32,32
E0 20728 DATA 32,32,32,32,32,32,32,93
72 20736 DATA 48,93,49,93,50,93,51,93
B4 20744 DATA 52,93,53,93,54,93,55,93
8E 20752 DATA 32,32,32,32,32,32,32,32
20 20760 DATA 32,93,133,93,32,5,14,1
8C 20768 DATA 2,12,5,32,32,45,32,107
EE 20776 DATA 67,91,67,91,67,91,67,91
C3 20784 DATA 64,91,64,91,64,91,64,115
36 20792 DATA 32,32,32,32,32,32,32,32
39 20800 DATA 32,109,64,125,32,32,32,32
49 20808 DATA 32,32,32,32,32,32,32,93
06 20816 DATA 48,93,48,93,48,93,48,93
CE 20824 DATA 48,93,48,93,48,93,48,93
9E 20832 DATA 32,32,32,32,32,32,32,32
66 20840 DATA 32,32,32,32,32,32,32,32
A3 20848 DATA 32,32,32,32,32,32,32,109
A6 20856 DATA 64,113,64,113,64,113,64,113
CB 20864 DATA 64,113,64,113,64,113,64,125
86 20872 DATA 32,32,32,32,32,32,32,32
0E 20880 DATA 32,32,32,32,32,32,32,32
96 20888 DATA 32,32,32,32,32,32,32,32
DE 20896 DATA 32,32,32,32,32,32,32,32
A6 20904 DATA 32,32,32,32,32,32,32,32
AE 20912 DATA 32,32,32,32,32,32,32,32
B6 20920 DATA 32,32,32,32,32,32,32,32
7E 20928 DATA 32,32,32,32,32,32,32,32
C6 20936 DATA 32,32,32,32,32,32,32,32
4E 20944 DATA 32,32,32,32,32,32,32,32
D6 20952 DATA 32,32,32,32,32,32,32,32
1E 20960 DATA 32,32,32,32,32,32,32,32
15 20968 DATA 32,32,32,32,32,32,32,112
BE 20976 DATA 64,114,64,114,64,114,64,114
C2 20984 DATA 64,114,64,114,64,114,64,110
05 20992 DATA 32,32,32,32,32,32,32,32
4A 21000 DATA 32,112,64,110,32,32,32,32
1E 21008 DATA 32,32,32,32,32,32,32,93
AD 21016 DATA 48,93,49,93,50,93,51,93
23 21024 DATA 52,93,53,93,54,93,55,93
6D 21032 DATA 32,32,32,32,32,32,32,32
B1 21040 DATA 32,93,152,93,32,24,45,5
82 21048 DATA 24,16,1,14,4,45,32,107
35 21056 DATA 64,91,64,91,64,91,64,91
AA 21064 DATA 64,91,64,91,64,91,64,115
55 21072 DATA 32,32,32,32,32,32,32,32
8E 21080 DATA 32,109,64,125,32,32,32,32
6E 21088 DATA 32,32,32,32,32,32,32,93
1D 21096 DATA 48,93,48,93,48,93,48,93
25 21104 DATA 48,93,48,93,48,93,48,93
3D 21112 DATA 32,32,32,32,32,32,32,32
85 21120 DATA 32,32,32,32,32,32,32,32
06 21128 DATA 32,32,32,32,32,32,32,109
F1 21136 DATA 64,113,64,113,64,113,64,113
7E 21144 DATA 64,113,64,113,64,113,64,125
A5 21152 DATA 32,32,32,32,32,32,32,32
ED 21160 DATA 32,32,32,32,32,32,32,32
B5 21168 DATA 32,32,32,32,32,32,32,32
7D 21176 DATA 32,32,32,32,32,32,32,32
C5 21184 DATA 32,32,32,32,32,32,32,32
0D 21192 DATA 32,32,32,32,32,32,32,32
D5 21200 DATA 32,32,32,32,32,32,32,32
9D 21208 DATA 32,32,32,32,32,32,32,32
E5 21216 DATA 32,32,32,32,32,32,32,32
2D 21224 DATA 32,32,32,32,32,32,32,32
F5 21232 DATA 32,32,32,32,32,32,32,32
BD 21240 DATA 32,32,32,32,32,32,32,32
3F 21248 DATA 32,32,32,32,32,32,32,112
04 21256 DATA 64,114,64,114,64,114,64,114
E8 21264 DATA 64,114,64,114,64,114,64,110
C4 21272 DATA 32,32,32,32,32,32,32,32
7F 21280 DATA 32,112,64,110,32,32,32,32
DF 21288 DATA 32,32,32,32,32,32,32,93
98 21296 DATA 48,93,49,93,50,93,51,93
F2 21304 DATA 52,93,53,93,54,93,55,93
4C 21312 DATA 32,32,32,32,32,32,32,32
06 21320 DATA 32,93,153,93,32,25,45,5
09 21328 DATA 24,16,1,14,4,45,32,107
1C 21336 DATA 64,91,64,91,64,91,64,91
71 21344 DATA 64,91,64,91,64,91,64,115
14 21352 DATA 32,32,32,32,32,32,32,32
0B 21360 DATA 32,109,64,125,32,32,32,32
AF 21368 DATA 32,32,32,32,32,32,32,93
F4 21376 DATA 48,93,48,93,48,93,48,93
3C 21384 DATA 48,93,48,93,48,93,48,93
9C 21392 DATA 32,32,32,32,32,32,32,32
44 21400 DATA 32,32,32,32,32,32,32,32
E5 21408 DATA 32,32,32,32,32,32,32,109
44 21416 DATA 64,113,64,113,64,113,64,113
55 21424 DATA 64,113,64,113,64,113,64,125
E4 21432 DATA 32,32,32,32,32,32,32,32
```

```
BF  21440 DATA 32,134,177,32,45,
     32,14,5
C6  21448 DATA 24,20,32,16,1,7,5
     ,32
DC  21456 DATA 32,32,32,32,32,32
     ,32,32
84  21464 DATA 32,32,32,32,32,32
     ,32,32
EC  21472 DATA 32,32,32,32,32,32
     ,32,32
84  21480 DATA 64,113,64,113,64,
     113.64.113
82  21488 DATA 64,113,64,113,64,
     125,32,32
6C  21496 DATA 32,32,32,32,32,32
     ,112,64
BA  21504 DATA 112,64,64,64,64,6
     4,110,32
20  21512 DATA 32,32,32,32,32,32
     ,32,112
52  21520 DATA 64,64,64,64,64,64
     ,110,32
63  21528 DATA 32,32,32,32,32,32
     ,32,32
5E  21536 DATA 62,32,32,32,32,32
     ,32,32
0F  21544 DATA 93,141,47,149,47,
     131,93,32
3C  21552 DATA 32,32,32,32,32,32
     ,32,93
4C  21560 DATA 144,129,135,133,1
     60,178,93,32
4B  21568 DATA 32,32,32,32,32,32
     ,32,32
13  21576 DATA 32,32,32,32,32,32
     ,32,32
62  21584 DATA 109,64,64,64,64,6
     4,125,32
F8  21592 DATA 32,32,32,32,32,32
     ,32,109
8C  21600 DATA 64,64,64,64,64,64
     ,125,32
33  21608 DATA 32,32,32,32,32,32
     ,32,32
7B  21616 DATA 32,32,32,32,32,32
     ,32,32
C3  21624 DATA 32,32,32,32,32,32
     ,32,32
8B  21632 DATA 32,32,32,32,32,32
     ,32,32
53  21640 DATA 32,32,32,32,32,32
     ,32,32
9B  21648 DATA 32,32,32,32,32,32
     ,32,32
E3  21656 DATA 32,32,32,32,32,32
     ,32,32
AB  21664 DATA 32,32,32,32,32,32
     ,32,32
73  21672 DATA 32,32,32,32,32,32
     ,32,32
BB  21680 DATA 32,32,32,32,32,32
     ,32,32
03  21688 DATA 32,32,32,32,32,32
     ,32,32
CB  21696 DATA 32,32,32,32,32,32
     ,32,32
93  21704 DATA 32,32,32,32,32,32
     ,32,32
08  21712 DATA 32,32,32,32,32,32
     ,32,112
9B  21720 DATA 64,114,64,114,64,
     114,64,114
47  21728 DATA 64,114,64,114,64,
DA  21976 DATA 32,32,32,32,32,32
     ,32,32
E2  21984 DATA 32,32,32,32,32,32
     ,32,32
EA  21992 DATA 32,32,32,32,32,32
     ,32,32
B2  22000 DATA 32,32,32,32,32,32
     ,32,32
FA  22008 DATA 32,32,32,32,32,32
     ,32,32
09  22016 DATA 32,32,32,32,32,32
     ,32,32
63  22024 DATA 32,112,64,110,32,
     21,19,5
4A  22032 DATA 32,32,32,32,32,32
     ,32,112
A7  22040 DATA 64,110,32,32,32,3
     2,32,32
29  22048 DATA 32,32,32,32,32,32
     ,32,32
71  22056 DATA 32,32,32,32,32,32
     ,32,32
83  22064 DATA 32,93,149,93,32,1
     9,16,18
71  22072 DATA 9,20,5,32,32,45,3
     2,93
A1  22080 DATA 48,93,32,32,32,32
     ,32,32
91  22088 DATA 32,32,32,32,32,32
     ,32,32
59  22096 DATA 32,32,32,32,32,32
     ,32,32
F8  22104 DATA 32,109,64,125,32,
     14,15,46
9E  22112 DATA 32,63,32,32,32,32
     ,32,109
BD  22120 DATA 64,125,32,32,32,3
     2,32,32
79  22128 DATA 32,32,32,32,32,32
     ,32,32
41  22136 DATA 32,32,32,32,32,32
     ,32,32
89  22144 DATA 32,32,32,32,32,32
     ,32,32
D1  22152 DATA 32,32,32,32,32,32
     ,32,32
99  22160 DATA 32,32,32,32,32,32
     ,32,32
61  22168 DATA 32,32,32,32,32,32
     ,32,32
A9  22176 DATA 32,32,32,32,32,32
     ,32,32
F1  22184 DATA 32,32,32,32,32,32
     ,32,32
B9  22192 DATA 32,32,32,32,32,32
     ,32,32
81  22200 DATA 32,32,32,32,32,32
     ,32,32
C9  22208 DATA 32,32,32,32,32,32
     ,32,32
11  22216 DATA 32,32,32,32,32,32
     114,64,110
B3  21736 DATA 32,32,32,32,32,32
     ,32,32
F3  21744 DATA 32,112,64,110,32,
     13,21,12
D1  21752 DATA 20,9,32,32,32,32,
     32,93
36  21760 DATA 48,93,49,93,50,93
     ,51,93
5B  21768 DATA 52,93,53,93,54,93
     ,55,93
D2  21776 DATA 32,32,32,32,32,32
     ,32,32
D9  21784 DATA 32,93,141,93,32,3
     2,32,32
37  21792 DATA 32,32,32,32,32,45
     ,32,107
52  21800 DATA 67,91,67,91,67,91
     ,67,91
27  21808 DATA 64,91,64,91,64,91
     ,64,115
3A  21816 DATA 32,32,32,32,32,32
     ,32,32
72  21824 DATA 32,109,64,125,32,
     3,15,12
D8  21832 DATA 15,21,18,32,32,32
     ,32,93
0A  21840 DATA 48,93,48,93,48,93
     ,48,93
92  21848 DATA 48,93,48,93,48,93
     ,48,93
62  21856 DATA 32,32,32,32,32,32
     ,32,32
6A  21864 DATA 32,32,32,32,32,32
     ,32,32
07  21872 DATA 32,32,32,32,32,32
     ,32,109
6A  21880 DATA 64,113,64,113,64,
     113,64,113
37  21888 DATA 64,113,64,113,64,
     113,64,125
8A  21896 DATA 32,32,32,32,32,32
     ,32,32
52  21904 DATA 32,32,32,32,32,32
     ,32,32
9A  21912 DATA 32,32,32,32,32,32
     ,32,32
A2  21920 DATA 32,32,32,32,32,32
     ,32,32
AA  21928 DATA 32,32,32,32,32,32
     ,32,32
72  21936 DATA 32,32,32,32,32,32
     ,32,32
BA  21944 DATA 32,32,32,32,32,32
     ,32,32
C2  21952 DATA 32,32,32,32,32,32
     ,32,32
CA  21960 DATA 32,32,32,32,32,32
     ,32,32
92  21968 DATA 32,32,32,32,32,32
     ,32,32
     ,32,32
87  22224 DATA 96,32,32,32,32,32
     ,32,32
D2  22232 DATA 32,32,32,32,32,32
     ,32,112
DD  22240 DATA 64,64,114,64,64,1
     14,64,64
1F  22248 DATA 114,64,64,114,64,
     64,114,64
BD  22256 DATA 64,114,64,64,114,
     64,64,110
86  22264 DATA 32,112,64,110,32,
     32,32,32
7B  22272 DATA 32,32,32,32,32,32
     ,32,93
E9  22280 DATA 32,48,93,32,49,93
     ,32,50
E2  22288 DATA 93,32,51,93,32,52
     ,93,32
B9  22296 DATA 53,93,32,54,93,32
     ,55,93
E1  22304 DATA 32,93,131,93,32,3
     ,15,12
62  22312 DATA 15,21,18,32,32,45
     ,96,107
C2  22320 DATA 64,64,91,64,64,91
     ,64,64
02  22328 DATA 91,64,64,91,64,64
     ,91,64
01  22336 DATA 64,91,64,64,91,64
     ,64,115
B7  22344 DATA 32,109,64,125,32,
     32,32,32
4B  22352 DATA 32,32,32,32,32,32
     ,32,93
C6  22360 DATA 48,48,93,48,48,93
     ,48,48
7E  22368 DATA 93,48,48,93,48,48
     ,93,48
C8  22376 DATA 48,93,48,48,93,48
     ,48,93
60  22384 DATA 32,32,32,32,32,32
     ,32,32
C1  22392 DATA 32,32,32,32,32,32
     ,32,109
FA  22400 DATA 64,64,113,64,64,1
     13,64,64
69  22408 DATA 113,64,64,113,64,
     64,113,64
FA  22416 DATA 64,113,64,64,113,
     64,64,125
A8  22424 DATA 32,32,32,32,32,32
     ,32,32
9E  22432 DATA 32,32,32,32,32,32
     ,32,96
B8  22440 DATA 32,32,32,32,32,32
     ,32,32
```

```
A0 22448 DATA 32,32,32,32,32,32,32,32
C8 22456 DATA 32,32,32,32,32,32,32,32
EB 22464 DATA 32,134,177,32,45,32,14,5
D2 22472 DATA 24,20,32,16,1,7,5,32
29 22480 DATA 32,32,32,32,134,179,32,45
70 22488 DATA 32,16,18,5,22,9,15,21
2F 22496 DATA 19,32,16,1,7,5,32,32
90 22504 DATA 0,0,0,0,0,0,0,0
E0 22512 DATA 32,32,32,32,32,32,32,32
B0 22520 DATA 32,32,32,32,32,32,112,64
B6 22528 DATA 112,64,64,64,64,64,110,32
04 22536 DATA 32,32,32,32,32,32,32,112
2E 22544 DATA 64,64,64,64,64,64,110,32
67 22552 DATA 32,32,32,32,32,32,32,32
2A 22560 DATA 62,32,32,32,32,32,32,32
F0 22568 DATA 93,144,47,131,47,130,93,32
20 22576 DATA 32,32,32,32,32,32,32,93
11 22584 DATA 144,129,135,133,160,179,93,32
4F 22592 DATA 32,32,32,32,32,32,32,32
17 22600 DATA 32,32,32,32,32,32,32,32
0E 22608 DATA 109,64,64,64,64,64,125,32
DC 22616 DATA 32,32,32,32,32,32,32,109
60 22624 DATA 64,64,64,64,64,64,125,32
37 22632 DATA 32,32,32,32,32,32,32,32
7F 22640 DATA 32,32,32,32,32,32,32,32
C8 22648 DATA 32,112,64,110,32,32,32,32
8F 22656 DATA 32,32,32,32,32,32,32,32
57 22664 DATA 32,32,32,32,32,32,32,32
9F 22672 DATA 32,32,32,32,32,32,32,32
E7 22680 DATA 32,32,32,32,32,32,32,32
D3 22688 DATA 32,93,130,93,32,45,32,19
B9 22696 DATA 16,18,9,20,5,32,41
C2 22704 DATA 20,1,32,16,15,9,14,20
CE 22712 DATA 5,18,19,32,40,49,54,48
B5 22720 DATA 45,50,53,53,41,32,32,32
4C 22728 DATA 32,109,64,125,32,32,32,32
DF 22736 DATA 32,32,32,32,32,32,32,32
27 22744 DATA 32,32,32,32,32,32,32,32
EF 22752 DATA 32,32,32,32,32,32,32,32
B7 22760 DATA 32,32,32,32,32,32,32,32
01 22768 DATA 112,64,64,64,110,112,64,64
3B 22776 DATA 64,110,112,64,64,64,110,112
A4 22784 DATA 64,64,64,110,112,64,64,64
DA 22792 DATA 110,112,64,64,64,110,112,64
DE 22800 DATA 64,64,110,112,64,64,64,110
26 22808 DATA 93,32,48,32,93,93,32,49
6E 22816 DATA 32,93,93,32,50,32,93,93
89 22824 DATA 32,51,32,93,93,32,52,32
07 22832 DATA 93,93,32,53,32,93,93,32
26 22840 DATA 54,32,93,93,32,55,32,93
C2 22848 DATA 109,64,64,64,125,109,64,64
6A 22856 DATA 64,125,109,64,64,64,125,109
74 22864 DATA 64,64,64,125,109,64,64,64
72 22872 DATA 125,109,64,64,64,125,109,64
3E 22880 DATA 64,64,125,109,64,64,64,125
1E 22888 DATA 112,64,64,64,110,112,64,64
6A 22896 DATA 64,110,112,64,64,64,110,112
EC 22904 DATA 64,64,64,110,112,64,64,64
52 22912 DATA 110,112,64,64,64,110,112,64
06 22920 DATA 64,64,110,112,64,64,64,110
39 22928 DATA 93,32,32,32,93,93,32,32
AA 22936 DATA 32,93,93,32,32,32,93,93
A2 22944 DATA 32,32,32,93,93,32,32,32
66 22952 DATA 93,93,32,32,32,93,93,32
15 22960 DATA 32,32,93,93,32,32,32,93
A1 22968 DATA 93,32,32,32,93,93,32,32
52 22976 DATA 32,93,93,32,32,32,93,93
9A 22984 DATA 32,32,32,93,93,32,32,32
4E 22992 DATA 93,93,32,32,32,93,93,32
0D 23000 DATA 32,32,93,93,32,32,32,93
C9 23008 DATA 93,32,32,32,93,93,32,32
FA 23016 DATA 32,93,93,32,32,32,93,93
B2 23024 DATA 32,32,32,93,93,32,32,32
F6 23032 DATA 93,93,32,32,32,93,93,32
88 23040 DATA 32,32,93,93,32,32,32,93
6D 23048 DATA 109,64,64,64,125,109,64,64
01 23056 DATA 64,125,109,64,64,64,125,109
F7 23064 DATA 64,64,64,125,109,64,64,64
C1 23072 DATA 125,109,64,64,64,125,109,64
E1 23080 DATA 64,64,125,109,64,64,64,125
67 23088 DATA 112,64,64,64,110,112,64,64
FD 23096 DATA 64,110,112,64,64,64,110,112
13 23104 DATA 64,64,64,110,112,64,64,64
0D 23112 DATA 110,112,64,64,64,110,112,64
EB 23120 DATA 64,64,110,112,64,64,64,110
57 23128 DATA 93,49,54,48,93,93,49,54
AD 23136 DATA 48,93,93,49,54,48,93,93
25 23144 DATA 49,54,48,93,93,49,54,48
32 23152 DATA 93,93,49,54,48,93,93,49
DA 23160 DATA 54,48,93,93,49,54,48,93
D5 23168 DATA 109,64,64,64,125,109,64,64
49 23176 DATA 64,125,109,64,64,64,125,109
1F 23184 DATA 64,64,64,125,109,64,64,64
09 23192 DATA 125,109,64,64,64,125,109,64
D9 23200 DATA 64,64,125,109,64,64,64,125
D5 23208 DATA 64,64,64,64,64,64,64,64
1D 23216 DATA 64,64,64,64,64,64,64,64
65 23224 DATA 64,64,64,64,64,64,64,64
AD 23232 DATA 64,64,64,64,64,64,64,64
F5 23240 DATA 64,64,64,64,64,64,64,64
CE 23248 DATA 32,32,32,32,32,32,32,112
33 23256 DATA 64,110,32,32,32,32,32,32
2D 23264 DATA 32,32,32,32,32,32,32,32
F5 23272 DATA 32,32,32,32,32,32,32,32
BD 23280 DATA 32,32,32,32,32,32,32,32
0E 23288 DATA 32,32,32,32,32,32,32,93
8D 23296 DATA 144,93,32,45,32,16,12,1
20 23304 DATA 3,5,32,19,16,18,9,20
A0 23312 DATA 5,32,15,14,32,19,3,18
FA 23320 DATA 5,5,14,32,32,32,32,32
0D 23328 DATA 32,32,32,32,32,32,32,109
46 23336 DATA 64,125,32,32,32,32,32,32
64 23344 DATA 32,32,32,32,32,32,32,32
4C 23352 DATA 32,32,32,32,32,32,32,32
F4 23360 DATA 32,32,32,32,32,32,32,32
8F 23368 DATA 32,32,32,32,32,32,32,112
F2 23376 DATA 64,110,32,32,32,32,32,32
6C 23384 DATA 32,32,32,32,32,32,32,32
1C 23392 DATA 32,32,32,32,32,32,96,96
7C 23400 DATA 32,32,32,32,32,32,32,32
AF 23408 DATA 32,32,32,32,32,32,32,93
65 23416 DATA 131,93,32,45,32,3,18,5
7B 23424 DATA 1,20,5,32,13,47,3,15
B4 23432 DATA 4,5,32,16,18,15,7,18
61 23440 DATA 1,13,32,32,32,32,32,32
E5 23448 DATA 32,32,32,32,32,32
```

```
    ,32,109
CO  23456 DATA 64,125,96,32,32,3
    2,32,32
BC  23464 DATA 32,32,32,32,32,32
    ,32,32
EA  23472 DATA 32,32,32,32,32,32
    ,32,96
CC  23480 DATA 32,32,32,32,32,32
    ,32,32
7F  23488 DATA 32,134,179,32,45,
    32,16,18
95  23496 DATA 5,22,9,15,21,19,3
    2,16
96  23504 DATA 1,7,5,32,32,32,32
    ,32
EC  23512 DATA 32,32,32,32,32,32
    ,32,32
94  23520 DATA 32,32,32,32,32,32
    ,32,32
35  23528 DATA 32,109,64,125,96,
    32,32,32
24  23536 DATA 32,32,32,32,32,32
    ,32,32
OC  23544 DATA 32,32,32,32,32,32
    ,32,32
45  23552 DATA 81,0,144,80,0,0,0
    ,88
33  23560 DATA 0,132,0,0,0,0,77,
    48
B6  23568 DATA 0,0,0,0,0,77,49,0
1B  23576 DATA 0,0,0,0,85,83,0,0
6D  23584 DATA 0,0,0,80,71,129,0
    ,0
88  23592 DATA 0,0,70,73,0,0,0,0
F1  23600 DATA 0,89,0,133,0,0,0,
    0
5E  23608 DATA 65,0,134,64,0,0,0
    ,66
C6  23616 DATA 0,134,64,0,0,0,67
    ,0
DE  23624 DATA 134,64,0,0,0,65,1
    28,1
C5  23632 DATA 221,159,0,0,68,0,
    132,0
55  23640 DATA 0,0,0,73,0,132,0,
    0
D4  23648 DATA 0,0,66,65,0,0,0,0
8D  23656 DATA 0,67,79,87,0,1,0,
    16
97  23664 DATA 129,0,0,0,0,129,0
    ,0
1F  23672 DATA 0,0,129,0,0,0,0,1
    29
7D  23680 DATA 0,0,0,0,129,0,0,0
DF  23688 DATA 0,129,0,0,0,0,129
    ,0
4D  23696 DATA 0,0,0,129,0,0,0,0
CB  23704 DATA 0,0,0,0,0,0,0,0
53  23712 DATA 0,0,0,0,0,0,0,0
5B  23720 DATA 0,0,0,0,0,0,0,0
63  23728 DATA 0,0,0,0,0,0,0,0
EB  23736 DATA 0,0,0,0,0,0,0,0
CC  23744 DATA 66,0,62,0,1,0,11,
    136
E3  23752 DATA 32,0,0,0,136,32,0
    ,0
CB  23760 DATA 0,136,32,0,0,0,13
    6,32
FA  23768 DATA 0,0,0,136,32,0,0,
    0
2B  23776 DATA 136,32,0,0,0,136,
    32,0
E2  23784 DATA 0,0,136,32,0,0,0,
    0
A3  23792 DATA 0,0,0,0,0,0,0,0
A7  23800 DATA 0,0,0,0,0,0,69,0,
    256
```

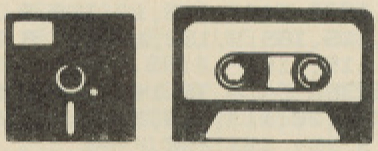
PROGRAM: SPRITE PROGRAMMER

```
48  10 L=L+1:IFL=1THENLOAD"SP.CO
    DE",8,1
CF  100 POKE198,0:PRINTCHR$(8):Q
    =53248
CO  110 PRINT"[CLR,WHITE]":POKES
    3281,11:POKE53280,11:POKE250
    ,0
49  120 SYS16384:SYS17016:FORX=0
    TO5:POKE16554+X,0:NEXT
86  130 PRINT"[UP2,C8,SPC9,CA,S*
    30,CS]"
95  140 PRINT"[SPC4,S-,RIGHT30,S
    -]"
7B  150 PRINT"[SPC4,CZ,S*30,CX]"
EE  160 PRINT"[YELLOW,DOWN2,RIGH
    T13,SPC5,CA,S*,CR,S*,CR,S*,C
    R,S*,CR,S*,CR,S*,CR,S*,CR,S*
    ,CS]"
00  170 PRINT"[SPC5,C6]SPRITE NO
    .-> [YELLOW,S-]0[S-]1[S-]2[S
    -]3[S-]4[S-]5[S-]6[S-]7[S-]"
6E  180 PRINT"[SPC18,CQ,S*,S+,S*
    ,S+,S*,S+,S*,S+,S*,S+,S*,S+,
    S*,S+,S*,CW]"
98  190 PRINT"[SPC5,C6]0=OFF/1=O
    N-> [YELLOW,S-]0[S-]0[S-]0[S
    -]0[S-]0[S-]0[S-]0[S-]0[S-]"
F4  200 PRINT"[SPC18,CZ,S*,CE,S*
    ,CE,S*,CE,S*,CE,S*,CE,S*,CE,
    S*,CE,S*,CX]"
A1  210 PRINT"[DOWN2,WHITE]F2[YE
    LLOW]=CHANGE BORDER[SPC3,WHI
    TE]F4[YELLOW]=CHANGE BACKGRO
    UND"
F7  220 PRINT"[WHITE,DOWN3,RIGHT
    6,RVSON] [RVSOFF] [C6]PRESS
    ANY KEY TO CONTINUE [WHITE,R
    VSON] [RVSOFF]":
C7  230 WAIT198,1:POKE198,0:M0=0
    :M1=0
BF  240 DIM CO(15):US=0:PG=1:SYS
    16580
36  250 FORX=0TO7:B(X)=160:CO(X)
    =1:NEXT
73  260 POKEQ+21,0:POKE53285,M0:
    POKE53286,M1:FI=0:PRINT"[WHI
    TE]"
D6  270 IFPG=1THENSYS16448:SYS16
    704:SYS16746:POKE56138,13:GO
    TO300
79  280 IFPG=2THENSYS16481:SYS16
    704:SYS16746:POKE56098,13:GO
    TO920
64  290 IFPG=3THENSYS16514:SYS16
    704:POKE55458,13:POKE56064,1
    3:POKE56184,13:GOTO1100
14  300 GOSUB620
11  310 GETA$:IFA$=""THENSYS1666
    1:GOTO310
2A  320 IFA$="E"THEN380
66  330 IFA$="X"THEN440
8E  340 IFA$="Y"THEN490
23  350 IFA$="[F1]"THENPG=PG+1:G
    OTO260
19  360 IFA$="[F7]"THEN1880
4C  370 GOTO310
41  380 GOSUB540
36  390 V=A-48:W=E(V):POKE16551,
    W
37  400 SYS16756:A=PEEK(16552)
8C  410 E(V)=A:GOTO300
03  420 SYS16756:A=PEEK(16552)
F0  430 E(V)=A:GOTO300
F6  440 GOSUB540:V=A-48:W=XE(V):
    POKE16551,W
4D  450 SYS16756:A=PEEK(16552)
38  460 XE(V)=A:GOTO300
39  470 SYS16756:A=PEEK(16552)
OC  480 XE(V)=A:GOTO300
EF  490 GOSUB540:V=A-48:W=YE(V):
    POKE16551,W
73  500 SYS16756:A=PEEK(16552)
E7  510 YE(V)=A:GOTO300
AE  520 SYS16756:A=PEEK(16552)
CO  530 YE(V)=A:GOTO300
BB  540 SYS16400
9F  550 A$="":SYS16661
55  560 GETA$:IFA$=""THEN550
53  570 IFASC(A$)<48 OR ASC(A$)>
    55THEN560
56  580 A=ASC(A$):POKE1063-6,A
9D  590 POKE16549,A
7D  600 PRINT"[HOME]"TAB(27)"[SP
    C5]>[SPC3]"
EA  610 RETURN
CD  620 X=0:Y=0
BD  630 A=E(X):A=A+48:B=XE(X):B=
    B+48:C=YE(X):C=C+48
53  640 POKE1360+Y,A:POKE1640+Y,
    B:POKE1920+Y,C
9D  650 X=X+1:Y=Y+2
E4  660 IFY=16THENRETURN
9C  670 GOTO630
E0  680 X=0:Y=0:Z=16
F6  690 A=MC(X):A=A+48
6D  700 POKE1360+Y,A
29  710 X=X+1:Y=Y+2
FE  720 IFY=16THEN750
E2  730 GOTO690
14  740 SYS16661
04  750 POKE1600,US+48
BB  760 X=0:Y=0:Z=0
6C  770 B=CO(X):B=B+48:IFB=>58TH
    EN820
36  780 Z=1
E1  790 POKE1880+Y+Z,B:Y=Y+3+M:X
    =X+1:N=0:Z=0:
ED  800 IFX=8THEN880
1C  810 GOTO770
02  820 A$=STR$(B-48)
55  830 C$=LEFT$(A$,2):B=VAL(C$)
    :B=B+48
AC  840 POKE1880+Y,B:C$=MID$(A$,
    3):B=VAL(C$):B=B+48:N=1
3D  850 POKE1880+Y+1-Z,B:Y=Y+3:Z
    =0
7A  860 X=X+1:IFX=8THEN880
50  870 GOTO770
00  880 X=0:Y=0
9D  890 A=MC(X):A=A+48:POKE1360+
    Y,A:X=X+1:Y=Y+2
6B  900 IFY=16THENRETURN
99  910 GOTO890
A4  920 GOSUB680
B7  930 GETA$:IFA$=""THENSYS1666
    1:GOTO930
63  940 IFA$="M"THEN1010
CD  950 IFA$="U"THEN1050
OE  960 IFA$="C"THEN1060
31  970 IFA$="[F1]"THENPG=PG+1:G
    OTO260
BB  980 IFA$="[F3]"THENPG=PG-1:G
    OTO260
71  990 IFA$="[F7]"THEN1880
D8  1000 GOTO930
C9  1010 GOSUB540
2B  1020 V=A-48:W=MC(V):POKE1655
    1,W
AE  1030 SYS16756:A=PEEK(16552)
E2  1040 MC(V)=A:GOTO920
CF  1050 GOSUB540:US=A-48:POKE16
    00,A:GOTO920
EE  1060 GOSUB540:V=A-48
FC  1070 INPUT"[HOME,RIGHT27]0-1
    5 ";CV
20  1080 IF CV<0 OR CV>15 THEN10
    70
96  1090 CO(V)=CV:GOSUB600:GOTO2
    60
4B  1100 REM ** PAGE III **
38  1110 FORX=0TO7:POKE2040+X.B(
```

```
    X):NEXT:GOSUB1200
74  1120 GETA$:IFA$=""THENSYS166
    61:GOTO1120
28  1130 IFA$="P"ANDE1>OTHEN1280
2D  1140 IFA$="C"THEN2070
8C  1150 IFA$="B"THEN1330
65  1160 IFA$="U"THENGOSUB540:US
    =A-48:GOTO260
46  1170 IFA$="[F3]"THENPG=PG-1:
    GOTO260
58  1180 IFA$="[F7]"THEN1880
A7  1190 GOTO1120
C8  1200 PRINT"[HOME,DOWN19]"TAB
    (25)US"[LEFT] ON SCREEN"
6A  1210 PRINT"[HOME,DOWN15]"B(O
    );B(1);B(2);B(3);B(4);B(5);B
    (6);B(7)
B3  1220 PRINT"[UP2,S-,RIGHT4,S-
    ,RIGHT4,S-,RIGHT4,S-,RIGHT4,
    S-,RIGHT4,S-,RIGHT4,S-,RIGHT
    4,S-]
EB  1230 GOSUB1380
4F  1240 POKE53271,0:POKE53277,0
    :X=0:GOSUB1490
45  1250 POKE53276,MC1
9A  1260 POKEQ+39+X,CO(X):X=X+1:
    IFX<=7THEN1250
FF  1270 SYS16768:POKEQ+21,E1:RE
    TURN
FB  1280 POKEQ+21,0:PRINT"[CLR]"
    :GOSUB1590:GOSUB1590:POKEQ+1
    6,0
92  1290 T=PEEK(53280):T1=PEEK(5
    3281):POKE53277,XE1:POKE5327
    1,YE1
D9  1300 POKE53280,R:POKE53281,R
    1:GOSUB1780:POKE16557,X
99  1310 POKE16554,US:POKE251,US
    :POKEQ+21,E1:SYS16837:R=PEEK
    (53280)
5F  1320 R1=PEEK(53281):POKE5328
    0,T:POKE53281,T1:GOTO260
29  1330 GOSUB540:V=A-48
53  1340 INPUT"[HOME,RIGHT24]160
    -255 ";CV
34  1350 IFCV<160 OR CV>255 THEN
    1340
35  1360 B(V)=CV
C0  1370 FORX=OTO7:POKE2040+X,B(
    X):NEXT:GOTO260
E6  1380 REM
05  1390 E1=0
A1  1400 IFE(O)=1THENE1=1
5F  1410 IFE(1)=1THENE1=E1+2
A4  1420 IFE(2)=1THENE1=E1+4
3F  1430 IFE(3)=1THENE1=E1+8
F9  1440 IFE(4)=1THENE1=E1+16
44  1450 IFE(5)=1THENE1=E1+32
06  1460 IFE(6)=1THENE1=E1+64
C4  1470 IFE(7)=1THENE1=E1+128
43  1480 RETURN
9F  1490 MC=0
63  1500 IFMC(O)=1THENMC1=1
06  1510 IFMC(1)=1THENMC1=MC1+2
31  1520 IFMC(2)=1THENMC1=MC1+4
D6  1530 IFMC(3)=1THENMC1=MC1+8
11  1540 IFMC(4)=1THENMC1=MC1+16
22  1550 IFMC(5)=1THENMC1=MC1+32
86  1560 IFMC(6)=1THENMC1=MC1+64
C2  1570 IFMC(7)=1THENMC1=MC1+12
    8
BC  1580 RETURN
4B  1590 XE=0
0E  1600 IFXE(O)=1THENXE1=1
06  1610 IFXE(1)=1THENXE1=XE1+2
35  1620 IFXE(2)=1THENXE1=XE1+4
A6  1630 IFXE(3)=1THENXE1=XE1+8
36  1640 IFXE(4)=1THENXE1=XE1+16
21  1650 IFXE(5)=1THENXE1=XE1+32
37  1660 IFXE(6)=1THENXE1=XE1+64
59  1670 IFXE(7)=1THENXE1=XE1+12
    8
D6  1680 YE=0
EA  1690 IFYE(O)=1THENYE1=1
7F  1700 IFYE(1)=1THENYE1=YE1+2
BC  1710 IFYE(2)=1THENYE1=YE1+4
DF  1720 IFYE(3)=1THENYE1=YE1+8
B1  1730 IFYE(4)=1THENYE1=YE1+16
5E  1740 IFYE(5)=1THENYE1=YE1+32
5E  1750 IFYE(6)=1THENYE1=YE1+64
36  1760 IFYE(7)=1THENYE1=YE1+12
    8
7E  1770 RETURN
C9  1780 IFUS=OTHENX=1
6B  1790 IFUS=1THENX=2
AB  1800 IFUS=2THENX=4
6E  1810 IFUS=3THENX=8
9A  1820 IFUS=4THENX=16
03  1840 IFUS=5THENX=32
13  1850 IFUS=6THENX=64
3B  1860 IFUS=7THENX=128
DB  1870 RETURN
D0  1880 REM
43  1890 POKEQ+21,0:SYS17744
31  1900 PRINT"[HOME,DOWN10]"TAB
    (29)MO
71  1910 PRINT"[HOME,DOWN13]"TAB
    (29)M1
28  1920 GETA$:IFA$=""THEN1920
55  1930 IFA$="S"THEN2750
9E  1940 IFA$="L"THEN2600
07  1950 IFA$="D"THENSYS17509:WA
    IT198,1:GOTO1880
A5  1960 IFA$="O"ANDMO<16THENMO=
    MO+1
80  1970 IFA$="M"THEN2030
51  1980 IFA$="1"ANDM1<16THENM1=
    M1+1
DC  1990 IFA$="[F7]"THEN260
36  2000 IFMO=16THENMO=0
B6  2010 IFM1=16THENM1=0
D4  2020 GOTO1890
86  2030 D=8:INPUT"[CLR,DOWN2,RI
    GHT3]ENTER DEVICE [RVSON,C6]
    1[WHITE,RVSOFF]=TAPE / [RVSO
    N,C6]8[WHITE,RVSOFF]=DISK";D
A9  2040 PRINT"[DOWN]ENTER FILEN
    AME : .";
62  2050 POKE253,D:SYS17184:SYS1
    7440:SYS16580
5A  2060 SYS17631:WAIT198,1:GOTO
    260
91  2070 REM
FE  2080 SA=49152:POKEQ+21,0
95  2090 PRINT"[CLR,DOWN2,YELLOW
    ] ENTER START ADDRESS (RETUR
    N = 49152)"
94  2100 INPUT"[DOWN,RIGHT]";SA
AF  2110 IFSA<12288 OR SA>52992
    THEN2090
14  2120 EA=0
0A  2130 GOSUB1380:IFE1=OTHENGOT
    O260
AD  2140 PRINT"[DOWN,RIGHT3,WHIT
    E,RVSON]PLEASE WAIT WHILE CR
    EATING PROGRAM"
2B  2150 POKESA+EA,169:EA=EA+1:P
    OKESA+EA,E1
03  2160 EA=EA+1:POKESA+EA,141:E
    A=EA+1:POKESA+EA,21:EA=EA+1:
    POKESA+EA,208
82  2170 GOSUB1490:IFMC1=OTHEN22
    00
49  2180 EA=EA+1:POKESA+EA,169:E
    A=EA+1:POKESA+EA,MC1
D8  2190 EA=EA+1:POKESA+EA,141:E
    A=EA+1:POKESA+EA,28:EA=EA+1:
    POKESA+EA,208
4F  2200 GOSUB1590:IFXE1=OTHEN22
    30
C2  2210 EA=EA+1:POKESA+EA,169:E
    A=EA+1:POKESA+EA,XE1
AF  2220 EA=EA+1:POKESA+EA,141:E
    A=EA+1:POKESA+EA,29:EA=EA+1:
    POKESA+EA,208
5F  2230 IFYE1=OTHEN2260
43  2240 EA=EA+1:POKESA+EA,169:E
    A=EA+1:POKESA+EA,YE1
27  2250 EA=EA+1:POKESA+EA,141:E
    A=EA+1:POKESA+EA,23:EA=EA+1:
    POKESA+EA,208
D4  2260 IFMC=OTHEN2310
CF  2270 EA=EA+1:POKESA+EA,169:E
    A=EA+1:POKESA+EA,MO
22  2280 EA=EA+1:POKESA+EA,141:E
    A=EA+1:POKESA+EA,37:EA=EA+1:
    POKESA+EA,208
DC  2290 EA=EA+1:POKESA+EA,169:E
    A=EA+1:POKESA+EA,M1
5F  2300 EA=EA+1:POKESA+EA,141:E
    A=EA+1:POKESA+EA,38:EA=EA+1:
    POKESA+EA,208
CF  2310 A=PEEK(250):EA=EA+1:POK
    ESA+EA,169:EA=EA+1:POKESA+EA
    ,A
CE  2320 EA=EA+1:POKESA+EA,141:E
    A=EA+1:POKESA+EA,16:EA=EA+1:
    POKESA+EA,208
DA  2330 A=17408:FORX=OTO7:IFE(X
    )=OTHEN NEXT
A5  2340 IFX=8THEN2440
F6  2350 EA=EA+1:POKESA+EA,169:E
    A=EA+1:POKESA+EA,CO(X)
D9  2360 EA=EA+1:POKESA+EA,141:E
    A=EA+1:POKESA+EA,39+X:EA=EA+
    1:POKESA+EA,208
A1  2370 EA=EA+1:POKESA+EA,169:E
    A=EA+1:POKESA+EA,PEEK(A+X*2)
B9  2380 EA=EA+1:POKESA+EA,141:E
    A=EA+1:POKESA+EA,X*2:EA=EA+1
    :POKESA+EA,208
04  2390 EA=EA+1:POKESA+EA,169:E
    A=EA+1:POKESA+EA,PEEK(A+1+X*
    2)
06  2400 EA=EA+1:POKESA+EA,141:E
    A=EA+1:POKESA+EA,1+X*2:EA=EA
    +1:POKESA+EA,208
76  2410 EA=EA+1:POKESA+EA,169:E
    A=EA+1:POKESA+EA,B(X)
08  2420 EA=EA+1:POKESA+EA,141:E
    A=EA+1:POKESA+EA,248+X:EA=EA
    +1:POKESA+EA,7
05  2430 NEXT
A7  2440 EA=EA+1:POKESA+EA,169:E
    A=EA+1:POKESA+EA,R
92  2450 EA=EA+1:POKESA+EA,141:E
    A=EA+1:POKESA+EA,32:EA=EA+1:
    POKESA+EA,208
DC  2460 EA=EA+1:POKESA+EA,169:E
    A=EA+1:POKESA+EA,R1
5F  2470 EA=EA+1:POKESA+EA,141:E
    A=EA+1:POKESA+EA,33:EA=EA+1:
    POKESA+EA,208
D8  2480 EA=EA+1:POKESA+EA,96
D8  2490 PRINT"[DOWN2]PROGRAM CR
    EATED"
73  2500 PRINT"[DOWN]START ADDRE
    SS:[RVSON]"SA
9A  2510 PRINT"[DOWN]END ADDRESS
    :[RVSON]"SA+EA
94  2520 D=8:INPUT"[DOWN,RIGHT][
    1]=TAPE / [8]=DISK (RETURN =
     8)";D
BB  2530 IFD<>8 AND D<>1 THEN251
    0
A0  2540 PRINT"[DOWN,RIGHT]SAVE
    TO DEVICE"D"UNDER THE FILENA
```

```
    ME..."
E4  2550 INPUTF$
0D  2560 IFLEN(F$)>16THENPRINT"[
    UP2]":GOTO2540
70  2570 SYS17127,"@0:"+F$,D,1,S
    A,SA+EA+1:SYS17631
46  2580 POKE198,0:PRINT"[DOWN]S
    AVED. SYS"SA"TO RUN CREATED
    FILE":WAIT198,1
15  2590 GOTO260
BD  2600 REM
A6  2610 PRINT"[CLR,DOWN2,RIGHT5
    ]LOAD VARIABLES":D=8
E5  2620 INPUT "[DOWN2] [8]=DISK
     / [1]=TAPE";D
8B  2630 INPUT"[DOWN2] ENTER FIL
    ENAME";F$
45  2640 IFD=8THENOPEN1,8,2,"@0:
    "+F$+"S,R":SYS17631
9A  2650 IFD=1THENOPEN1,1,0,F$:S
    YS17631
B4  2660 INPUT#1,M0
7F  2670 INPUT#1,M1
D0  2680 INPUT#1,MSB,R,R1
E7  2690 FORI=0TO7
0D  2700 INPUT#1,E(I),MC(I),XE(I
    ),YE(I),CO(I),B(I),P0(I),P1(
    I)
C0  2710 NEXTI:CLOSE1
1F  2720 FORX=0TO7:POKE17408+X,P
    0(X):POKE17416+X,P1(X):NEXT:
    POKE250,MSB
89  2730 GOTO260
31  2740 REM
EB  2750 FORX=0TO7:P0(X)=PEEK(17
    408+X):P1(X)=PEEK(17416+X):N
    EXT:MSB=PEEK(250)
7A  2760 PRINT"[CLR,DOWN2,RIGHT4
    ]SAVE VARIABLES":D=8
C3  2770 INPUT "[DOWN2] [8]=DISK
     / [1]=TAPE";D
C1  2780 INPUT"[DOWN2] ENTER FIL
    ENAME";F$
2D  2790 IFD=8THENOPEN2,8,2,"@0:
    "+F$+"S,W":SYS17631
92  2800 IFD=1THENOPEN2,1,1,F$:S
    YS17631
1F  2810 PRINT#2,M0
03  2820 PRINT#2,M1
19  2830 PRINT#2,MSB;CHR$(13);R;
    CHR$(13);R1;CHR$(13)
64  2840 FORI=0TO7
B9  2850 PRINT#2,E(I);CHR$(13);M
    C(I);CHR$(13);XE(I);CHR$(13)
    ;YE(I);CHR$(13);
A1  2860 PRINT#2,CO(I);CHR$(13);
    B(I);CHR$(13);P0(I);CHR$(13)
    ;P1(I);CHR$(13);
E4  2870 NEXTI:CLOSE2
F2  2880 GOTO260
```

## Graphic Editor



PROGRAM: CHAR ED LOAD

```
EC  1 REM ** THIS PROGRAM IS USE
    D TO **
03  2 REM ** CREATE A COPY OF TH
    E    **
43  3 REM ** CHAR EDITOR ON YOUR
     OWN **
9D  4 REM ** TAPE OR DISK
         **
E9  10 BL=337:LN=50:SA=28672
60  20 FOR L=0 TO BL:CX=0:FOR D=
    0 TO 15:READA:CX=CX+A
B7  30 POKE53280,A:POKE SA+L*16+
    D,A:NEXT D
73  40 READ A:IF A><CX THENPRINT
    "ERROR IN LINE";LN+(L*10):ST
    OP
FE  45 NEXT L:SYS 33904
8B  50 DATA 34,8,195,7,158,50,48
    ,56,48,58,143,34,20,20,20,20
    ,919
91  60 DATA 82,65,84,84,0,0,0,0,
    0,0,0,0,0,0,0,162,477
74  70 DATA 0,189,57,8,157,0,1,2
    32,224,161,208,245,162,13,18
    9,222,2079
7C  80 DATA 8,149,234,202,16,248
    ,120,165,1,133,237,160,0,132
    ,1,76,1882
18  90 DATA 0,1,177,244,145,239,
    230,238,208,2,230,239,230,24
    4,208,2,2636
53  100 DATA 230,245,165,239,197
    ,243,144,234,208,6,165,238,1
    97,242,144,225,3123
BB  110 DATA 177,242,145,240,199
    ,240,165,240,201,255,208,2,1
    98,241,199,242,3192
1F  120 DATA 165,242,201,255,208
    ,2,199,243,165,243,201,8,176
    ,226,165,240,2938
79  130 DATA 24,105,2,133,240,20
    8,2,230,237,160,0,177,240,19
    7,236,240,2431
F9  140 DATA 39,238,0,4,145,234,
    230,234,208,2,230,235,230,24
    0,208,2,2479
8C  150 DATA 230,241,165,241,197
    ,247,144,225,208,6,165,240,1
    97,246,144,217,3113
C2  160 DATA 165,237,133,1,88,76
    ,32,8,160,2,177,240,170,136,
    177,240,2042
C0  170 DATA 136,145,234,72,230,
    234,208,2,230,235,104,202,20
    8,243,165,240,2898
B7  180 DATA 24,105,3,133,240,14
    4,178,230,241,169,0,240,172,
    1,8,51,1939
DC  190 DATA 0,1,8,242,29,132,27
    ,235,8,242,29,22,8,195,7,158
    ,1344
69  200 DATA 50,48,55,48,58,143,
    34,51,20,4,82,65,84,84,51,0,
    878
A8  210 DATA 11,162,0,189,115,8,
    157,0,1,232,224,147,208,245,
    162,0,1861
3C  220 DATA 189,10,9,157,0,2,23
    2,224,84,208,245,169,62,133,
    252,169,2145
A2  230 DATA 3,133,253,173,6,9,1
    33,250,173,7,9,133,251,173,8
    ,9,1723
E3  240 DATA 133,249,173,9,9,133
    ,249,165,248,56,229,250,133,
    254,165,249,2703
B7  250 DATA 229,251,133,255,165
    ,254,24,105,61,133,254,165,2
    55,105,3,133,2525
E6  260 DATA 255,76,0,1,120,165,
    1,133,247,169,0,133,1,160,0,
    177,1638
8B  270 DATA 250,145,252,230,250
    ,208,2,230,251,230,252,208,2
    ,230,253,165,3158
AB  280 DATA 251,197,249,144,234
    ,208,6,165,250,197,248,144,2
    26,162,8,189,2878
9A  290 DATA 0,2,24,125,2,2,133,
    250,189,1,2,125,3,2,133,251,
    1244
8E  300 DATA 165,250,56,233,1,13
    3,250,165,251,233,0,133,251,
    189,2,2,2314
84  310 DATA 133,252,189,3,2,133
    ,253,160,0,177,254,145,250,1
    65,254,56,2426
EF  320 DATA 233,1,133,254,165,2
    55,233,0,133,255,165,250,56,
    233,1,133,2500
FC  330 DATA 250,165,251,233,0,1
    33,251,165,252,56,233,1,133,
    252,165,253,2793
A7  340 DATA 233,0,133,253,5,252
    ,208,209,138,56,233,4,170,16
    ,160,165,2235
34  350 DATA 247,133,1,88,76,0,9
    4,24,9,242,29,112,61,33,14,0
    ,1133
1A  360 DATA 98,55,1,0,112,130,5
    ,0,0,32,79,51,119,8,80,32,80
    2
55  370 DATA 3,8,1,18,1,3,20,5,1
    8,32,79,51,119,15,80,32,485
50  380 DATA 32,116,9,51,32,7,10
    6,51,32,11,116,51,32,15,106,
    32,799
83  390 DATA 32,116,51,32,8,106,
    51,32,4,51,48,3,51,32,4,116,
    737
01  400 DATA 51,32,3,3,8,1,18,1,
    3,20,5,18,51,32,3,106,355
C5  410 DATA 32,32,116,9,14,19,2
    0,18,21,3,20,106,51,32,11,11
    6,620
B9  420 DATA 51,32,3,51,119,9,51
    ,32,3,106,32,32,116,51,32,8,
    728
9A  430 DATA 106,51,32,11,116,51
    ,32,4,5,4,9,20,15,18,51,32,5
    57
BA  440 DATA 5,106,32,32,115,51,
    32,8,106,51,32,11,116,51,32,
    4,785
B6  450 DATA 51,119,6,51,32,5,10
    6,32,32,116,3,51,32,7,106,51
    ,800
51  460 DATA 32,11,116,1,45,10,4
    6,7,15,21,12,4,32,32,49,57,4
    91
00  470 DATA 56,53,106,32,32,116
    ,51,32,8,106,51,32,11,116,51
    ,119,972
84  480 DATA 15,106,32,32,116,3,
    15,14,20,9,14,21,5,106,51,32
    ,591
D8  490 DATA 11,116,51,32,15,106
    ,32,32,76,51,111,8,122,51,32
    ,11,857
DA  500 DATA 76,51,111,15,122,32
    ,51,254,3,51,134,3,51,138,3,
    51,1146
9A  510 DATA 146,3,51,162,3,51,1
    94,3,51,254,3,51,0,3,51,254,
    1280
0C  520 DATA 3,134,2,2,139,2,2,1
    46,254,254,162,2,128,194,2,1
    28,1553
59  530 DATA 51,254,3,51,0,19,25
    4,254,128,134,128,128,138,12
    8,128,146,1944
09  540 DATA 254,144,162,130,144
    ,194,130,144,51,254,3,51,0,3
    ,51,254,1969
8B  550 DATA 3,134,130,129,139,1
    30,128,146,254,254,162,2,130
    ,194,2,130,2065
09  560 DATA 51,254,3,51,0,19,16
    ,254,254,48,2,130,16,2,130,1
    6,1246
73  570 DATA 254,254,16,128,130,
    16,128,130,56,254,254,51,0,3
    ,16,254,1944
52  580 DATA 254,48,128,134,16,1
    28,138,16,254,146,16,130,162
    ,16,130,194,1910
35  590 DATA 56,254,254,51,0,19,
    16,254,254,48,130,2,16,130,2
```

```
    ,16,1502
8F  600 DATA 254,254,16,2,128,16
    ,2,128,56,254,254,51,0,3,254
    ,254,1926
4E  610 DATA 128,2,2,129,2,2,129
    ,254,254,144,128,128,144,128
    ,128,144,1844
B5  620 DATA 51,254,3,51,0,19,16
    9,7,133,44,169,64,141,138,2,
    169,1414
B3  630 DATA 0,133,157,169,2,141
    ,134,2,169,2,141,32,208,169,
    7,141,1607
F2  640 DATA 33,208,173,2,221,9,
    3,141,2,221,173,0,221,41,252
    ,9,1709
12  650 DATA 1,141,0,221,169,9,1
    41,24,208,169,128,141,136,2,
    32,110,1632
11  660 DATA 75,32,228,114,160,0
    ,185,0,63,153,0,132,200,208,
    247,160,1957
98  670 DATA 3,169,6,153,39,208,
    152,10,168,169,40,153,0,208,
    152,51,1681
14  680 DATA 10,3,24,105,185,153
    ,1,208,152,74,168,24,105,16,
    153,248,1630
72  690 DATA 131,136,16,221,169,
    15,141,21,208,162,8,169,0,13
    3,2,133,1665
FC  700 DATA 255,169,8,133,38,16
    9,11,133,39,169,174,133,251,
    133,253,169,2237
C9  710 DATA 130,133,252,169,218
    ,133,254,160,0,165,255,145,2
    51,132,40,230,2567
7B  720 DATA 2,165,2,41,1,133,2,
    168,185,38,0,164,40,145,253,
    200,1539
A4  730 DATA 230,255,192,32,208,
    227,24,165,251,105,40,133,25
    1,133,253,144,2643
CB  740 DATA 4,230,252,230,254,2
    30,2,202,208,205,169,112,133
    ,251,169,61,2712
30  750 DATA 133,252,169,40,133,
    253,169,128,133,254,169,255,
    133,38,169,62,2490
A1  760 DATA 32,0,112,169,208,32
    ,35,112,32,140,112,169,208,1
    33,252,169,1915
A2  770 DATA 160,32,39,112,169,0
    ,160,32,153,0,96,136,16,250,
    169,1,1525
B5  780 DATA 141,34,208,169,2,14
    1,35,208,32,193,112,201,73,2
    08,3,32,1792
73  790 DATA 65,71,201,67,208,24
    2,32,222,112,160,136,169,32,
    153,255,96,2221
51  800 DATA 136,208,250,32,28,1
    13,32,92,113,173,11,96,208,1
    2,24,173,1701
65  810 DATA 11,96,105,4,141,11,
    96,32,55,65,76,170,65,162,42
    ,160,1291
94  820 DATA 4,152,72,32,155,113
    ,104,168,202,202,136,136,16,
    243,247,165,1924
D2  830 DATA 38,105,82,133,38,16
    5,39,105,129,133,39,165,40,1
    05,103,133,1551
22  840 DATA 40,165,41,105,129,1
    33,41,165,42,105,174,133,42,
    165,43,105,1627
4E  850 DATA 218,133,43,160,0,17
    3,7,96,209,27,177,38,141,8,9
    6,177,1702
AD  860 DATA 40,141,9,96,177,42,
    141,10,96,169,1,145,42,169,9
    1,145,1514
1E  870 DATA 38,145,40,208,15,17
    3,8,96,145,38,173,9,96,145,4
    0,173,1542
D5  890 DATA 10,96,145,42,24,173
    ,7,96,105,1,41,1,141,7,96,96
    ,1081
F3  890 DATA 32,159,255,32,228,2
    55,208,3,76,35,65,162,4,134,
    251,162,2061
64  900 DATA 98,134,252,174,0,98
    ,160,0,209,251,240,18,72,24,
    165,251,2146
D7  910 DATA 105,3,133,251,144,2
    ,230,252,104,202,208,236,240
    ,210,200,177,2597
BC  920 DATA 251,133,253,200,177
    ,251,133,254,173,7,96,240,3,
    32,55,65,2323
60  930 DATA 169,69,72,169,163,7
    2,108,253,0,104,104,76,209,1
    12,173,12,1865
08  940 DATA 96,10,168,96,32,248
    ,65,185,1,96,105,1,197,44,24
    0,4,1588
D1  950 DATA 144,2,159,0,153,1,9
    6,96,32,248,65,185,2,96,105,
    1,1395
B0  960 DATA 41,7,153,2,96,96,32
    ,248,65,56,185,1,96,233,1,16
    ,1329
A2  970 DATA 2,165,44,153,1,96,9
    6,32,248,65,56,185,2,96,233,
    1,1475
F2  980 DATA 41,7,153,2,96,96,17
    3,12,96,208,16,32,228,113,5,
    255,1533
05  990 DATA 145,253,32,92,113,3
    2,28,113,76,254,65,201,1,208
    ,12,32,1557
47  1000 DATA 253,113,173,0,96,1
    53,0,97,76,79,66,173,13,96,1
    41,12,1541
5D  1010 DATA 95,173,14,96,141,0
    ,98,165,45,133,44,173,6,96,5
    1,10,1341
03  1020 DATA 5,109,5,96,141,0,9
    6,32,92,113,76,15,114,173,12
    ,96,1175
07  1030 DATA 208,15,32,229,113,
    56,169,255,229,255,49,253,14
    5,253,76,76,2412
BD  1040 DATA 66,32,253,113,169,
    32,153,0,97,76,79,66,173,12,
    96,208,1625
CD  1050 DATA 8,238,12,96,169,14
    ,76,60,115,206,12,96,169,7,7
    6,60,1414
FD  1060 DATA 115,173,12,96,141,
    13,96,169,2,141,12,96,165,44
    ,133,45,1453
24  1070 DATA 173,0,98,141,14,96
    ,169,6,141,0,98,169,31,133,4
    4,96,1409
54  1080 DATA 32,248,65,169,0,15
    3,1,96,76,18,66,32,248,65,16
    9,0,1438
18  1090 DATA 153,1,96,153,2,96,
    96,173,12,96,208,24,173,0,96
    ,32,1411
A5  1100 DATA 70,113,160,7,169,0
    ,145,253,136,16,251,32,92,11
    3,32,28,1617
C8  1110 DATA 113,76,231,66,160,
    137,169,32,153,255,96,136,20
    8,250,76,10,2168
3C  1120 DATA 67,169,255,133,38,
    32,118,114,208,1,96,32,207,1
    14,109,3,1696
1A  1130 DATA 96,168,173,3,96,20
    8,2,200,202,185,0,97,153,255
    ,96,200,2134
D0  1140 DATA 202,208,246,169,32
    ,153,255,96,173,3,96,240,3,2
    06,3,96,2181
2D  1150 DATA 76,28,113,169,0,13
    3,38,32,118,114,208,1,96,32,
    207,114,1479
4D  1160 DATA 105,14,168,202,240
    ,11,185,255,96,153,0,97,136,
    202,208,246,2318
44  1170 DATA 169,32,153,0,97,76
    ,29,113,173,12,96,208,24,173
    ,0,96,1450
79  1180 DATA 32,70,113,160,7,56
    ,169,255,241,253,145,253,136
    ,16,247,32,2185
1E  1190 DATA 92,113,76,28,113,1
    60,137,185,255,96,73,128,153
    ,255,96,136,2096
CC  1200 DATA 208,245,76,28,113,
    173,22,208,73,16,141,22,208,
    96,160,4,1793
DA  1210 DATA 165,44,170,169,31,
    133,44,24,96,32,170,67,239,0
    ,96,32,1511
9C  1220 DATA 1,66,173,5,96,208,
    4,24,32,21,66,138,133,44,32,
    92,1135
6C  1230 DATA 113,76,15,114,32,1
    70,67,206,0,95,32,35,66,176,
    3,32,1233
B1  1240 DATA 52,66,76,199,67,17
    3,0,95,32,70,113,169,82,133,
    251,169,1748
42  1250 DATA 128,133,252,160,0,
    162,8,169,0,133,255,177,251,
    201,32,240,2301
B0  1250 DATA 3,56,208,1,24,165,
    255,106,133,255,165,251,105,
    40,133,251,2151
18  1270 DATA 144,2,230,252,202,
    208,229,56,165,251,233,64,13
    3,251,165,252,2836
C6  1280 DATA 233,1,133,252,200,
    192,9,240,9,136,165,255,145,
    253,200,76,2499
9D  1290 DATA 241,67,32,92,113,7
    6,28,113,169,6,162,12,160,0,
    32,8,1311
F8  1300 DATA 115,32,193,112,72,
    173,0,96,32,70,113,104,160,7
    ,201,3,1483
CE  1310 DATA 240,30,201,78,240,
    29,201,83,240,46,201,69,240,
    60,201,87,2246
6F  1320 DATA 208,223,177,253,10
    ,145,253,136,16,248,32,92,11
    3,32,28,113,2079
C8  1330 DATA 76,49,115,160,1,17
    7,253,136,145,253,200,200,19
    2,8,208,245,2418
31  1340 DATA 136,169,0,145,253,
    76,102,68,234,136,177,253,20
    0,145,253,136,2483
00  1350 DATA 136,16,247,200,152
    ,145,253,76,102,68,177,253,7
    4,145,253,136,2433
FF  1360 DATA 16,248,76,102,68,1
    69,10,162,12,160,0,32,8,115,
    169,8,1355
17  1370 DATA 162,12,160,5,32,8,
    115,169,9,162,12,160,8,32,8,
    115,1169
BD  1380 DATA 32,149,115,240,29,
    32,70,113,165,253,133,251,16
    5,254,133,252,2386
86  1390 DATA 173,0,96,32,70,113
    ,160,7,177,253,145,251,136,1
    6,249,32,1910
54  1400 DATA 28,113,76,49,115,1
    69,20,162,12,160,0,32,8,115,
    32,193,1284
DB  1410 DATA 112,201,3,240,29,2
    01,85,240,28,201,76,208,241,
    169,223,141,2398
2E  1420 DATA 57,112,169,216,32,
    35,112,169,215,141,57,112,32
    ,92,113,32,1696
84  1430 DATA 28,113,76,49,115,1
    69,208,32,35,112,76,8,69,169
```

```
      ,12,170,1441
7B    1440 DATA 160,0,32,8,115,169
      ,9,162,12,160,5,32,8,115,32,
      149,1168
B2    1450 DATA 115,240,33,141,0,9
      6,51,74,5,141,6,96,51,10,5,1
      33,1197
BA    1460 DATA 255,56,173,0,96,22
      9,255,141,5,96,32,92,113,32,
      15,114,1704
55    1470 DATA 76,49,115,169,11,3
      2,21,117,240,37,197,43,144,3
      3,32,70,1386
53    1480 DATA 113,165,61,133,251
      ,165,62,133,252,24,165,253,1
      05,7,133,253,2275
59    1490 DATA 144,2,230,254,169,
      0,32,3,113,32,92,113,32,28,1
      13,76,1433
74    1500 DATA 49,115,169,13,162,
      12,160,0,32,8,115,169,19,162
      ,12,160,1357
C8    1510 DATA 12,32,8,115,32,193
      ,112,201,3,240,228,201,133,2
      08,245,104,2067
E8    1520 DATA 104,76,226,252,169
      ,128,141,11,96,76,49,65,169,
      7,32,97,1698
C2    1530 DATA 116,173,224,129,20
      1,32,240,32,173,254,101,170,
      168,32,84,75,2204
18    1540 DATA 173,255,101,162,0,
      160,102,32,189,255,169,0,32,
      213,255,32,2130
22    1550 DATA 28,113,32,92,113,3
      2,140,112,76,102,75,169,8,32
      ,97,116,1337
40    1560 DATA 173,224,129,201,32
      ,240,31,173,254,101,170,160,
      96,32,186,255,2457
7E    1570 DATA 32,88,117,32,87,75
      ,169,0,170,133,251,169,136,1
      33,252,169,2013
37    1580 DATA 251,160,144,32,216
      ,255,76,213,69,169,21,162,12
      ,160,0,32,1972
62    1590 DATA 8,115,162,15,32,12
      9,115,144,237,32,49,115,169,
      1,133,251,1707
66    1600 DATA 169,8,133,252,169,
      0,133,253,169,136,133,254,16
      9,100,133,38,2249
92    1610 DATA 169,10,133,39,169,
      1,133,40,169,158,133,41,169,
      97,133,42,1636
82    1620 DATA 24,165,41,105,10,1
      33,41,144,2,230,42,160,255,1
      62,4,200,1718
92    1630 DATA 177,253,208,10,152
      ,72,160,2,169,0,133,61,240,3
      7,133,255,2062
C1    1640 DATA 152,72,169,0,133,6
      2,160,255,169,255,133,61,200
      ,165,255,133,2374
16    1650 DATA 255,56,249,38,0,23
      0,61,176,246,165,61,208,4,16
      5,62,240,2216
AC    1660 DATA 231,230,62,152,72,
      232,138,168,24,165,61,105,48
      ,145,251,104,2188
AB    1670 DATA 168,192,2,208,211,
      232,138,168,169,44,145,251,1
      04,168,192,15,2407
42    1680 DATA 208,173,138,168,16
      0,0,24,232,138,101,251,145,2
      51,72,200,165,2425
37    1690 DATA 252,105,0,145,251,
      72,200,165,41,145,251,200,16
      5,42,145,251,2430
C4    1700 DATA 200,169,131,145,25
      1,202,138,168,169,0,145,251,
      104,133,252,104,2562
C9    1710 DATA 133,251,24,169,16,
      101,253,133,253,144,8,230,25
      4,165,254,201,2589
9C    1720 DATA 144,240,3,76,64,70
      ,169,0,168,145,251,200,145,2
      51,165,251,2342
8E    1730 DATA 133,78,165,252,133
      ,79,169,8,32,97,116,173,224,
      129,201,32,2021
D1    1740 DATA 240,31,169,8,170,1
      60,96,32,186,255,32,88,117,1
      66,78,164,1992
0A    1750 DATA 79,169,1,133,251,1
      69,8,133,252,169,251,32,216,
      255,32,140,2290
01    1760 DATA 112,76,49,115,169,
      13,162,12,160,0,32,8,115,169
      ,14,162,1368
46    1770 DATA 12,160,12,32,8,115
      ,32,193,112,201,3,240,228,20
      1,133,208,1890
47    1780 DATA 245,32,170,112,32,
      49,115,169,0,141,21,208,133,
      251,169,128,1975
E1    1790 DATA 133,252,169,0,133,
      253,169,148,133,254,169,231,
      133,38,169,131,2515
5B    1800 DATA 32,0,112,169,0,133
      ,251,169,215,133,252,169,0,1
      33,253,169,2191
88    1810 DATA 152,133,254,169,23
      1,133,38,169,219,32,0,112,32
      ,110,75,169,2028
35    1820 DATA 211,133,251,169,71
      ,133,252,169,0,133,253,169,1
      28,133,254,169,2629
89    1830 DATA 83,133,38,169,75,3
      2,0,112,162,24,32,129,115,32
      ,140,112,1389
81    1840 DATA 169,15,141,21,208,
      169,0,133,251,133,253,169,14
      8,133,252,169,2364
00    1850 DATA 128,133,254,169,23
      1,133,38,169,151,32,0,112,16
      9,0,133,251,2103
28    1850 DATA 133,253,169,152,13
      3,252,169,216,133,254,169,23
      1,133,38,169,155,2759
F4    1870 DATA 76,0,112,32,2,32,2
      ,18,9,14,7,32,4,15,23,14,392

01    1880 DATA 32,3,8,1,18,1,3,20
      ,5,18,19,32,6,18,15,13,212
D9    1890 DATA 32,18,15,13,51,32,
      8,3,32,3,15,16,25,32,3,8,306

8E    1900 DATA 1,18,1,3,20,5,18,5
      1,32,24,4,32,4,1,20,1,235
5D    1910 DATA 32,20,15,32,2,1,19
      ,9,3,51,32,25,5,32,5,18,301
DC    1920 DATA 1,19,5,32,3,8,1,18
      ,1,3,20,5,18,19,32,32,217
34    1930 DATA 7,32,7,15,20,15,32
      ,3,8,1,18,1,3,20,5,18,205
10    1940 DATA 51,32,4,8,32,19,5,
      1,18,3,8,32,2,15,20,20,270
CD    1950 DATA 15,13,32,23,9,14,4
      ,15,23,32,5,15,18,32,3,8,252
DA    1960 DATA 1,18,1,3,20,5,18,5
      1,32,6,45,32,3,21,18,19,293
5F    1970 DATA 15,18,19,32,58,32,
      13,15,22,5,13,5,14,20,44,32,
      357
37    1980 DATA 6,55,32,58,32,19,5
      ,12,5,3,20,51,32,5,9,32,376
48    1990 DATA 9,14,19,20,18,21,3
      ,20,9,15,14,19,51,32,26,12,3
      02
AE    2000 DATA 44,19,32,12,15,1,4
      ,44,19,1,22,5,32,3,8,1,262
E7    2010 DATA 18,1,3,20,5,18,19,
      51,32,16,13,32,13,21,12,20,2
      94
78    2020 DATA 9,3,15,12,15,21,18
      ,32,15,14,47,15,6,6,51,32,31
      1
ED    2030 DATA 20,16,32,16,21,12,
      12,32,3,8,1,18,1,3,20,5,220
34    2040 DATA 18,32,40,14,44,19,
      44,5,44,23,41,32,32,18,32,18
      ,456
5A    2050 DATA 15,20,1,20,5,51,32
      ,4,23,32,23,9,14,4,15,23,291

33    2060 DATA 32,3,15,14,20,18,1
      5,12,32,58,32,3,8,1,14,7,284

4F    2070 DATA 5,32,20,15,32,12,5
      ,6,20,47,18,9,7,8,20,32,288
BA    2080 DATA 43,32,14,5,24,20,3
      2,3,8,1,18,1,3,20,5,18,247
A7    2090 DATA 51,32,24,45,32,16,
      18,5,22,9,15,21,19,32,3,8,35
      2
7A    2100 DATA 1,18,1,3,20,5,19,5
      1,32,60,3,21,18,19,15,18,303

D5    2110 DATA 19,44,18,5,20,21,1
      8,14,44,4,5,12,5,20,5,44,298

89    2120 DATA 5,20,3,32,58,32,13
      ,15,22,5,13,5,14,20,51,32,34
      0
CB    2130 DATA 44,19,16,1,3,5,32,
      58,32,5,18,1,19,5,32,16,306
0B    2140 DATA 15,9,14,20,32,44,6
      ,55,32,58,32,16,12,15,20,32,
      412
35    2150 DATA 16,15,9,14,20,51,3
      2,44,3,20,18,12,47,18,22,19.
      360
35    2160 DATA 32,15,14,32,58,32,
      18,5,22,5,18,19,5,32,13,15,3
      35
90    2170 DATA 4,5,32,15,6,32,23,
      9,14,4,15,23,51,32,44,18,327

5E    2180 DATA 21,14,47,19,20,15,
      16,32,58,32,1,2,15,18,20,32,
      362
59    2190 DATA 3,15,13,13,1,14,4,
      51,32,56,24,32,58,32,5,24,37
      7
92    2200 DATA 9,20,32,16,18,15,7
      ,18,1,13,32,186,255,32,49,11
      5,818
3F    2210 DATA 169,0,141,21,208,1
      68,162,12,24,76,240,255,169,
      255,141,21,2062
B6    2220 DATA 208,76,49,115,160,
      250,169,32,153,255,127,153,2
      49,128,153,243,2520
E8    2230 DATA 129,153,237,130,17
      3,134,2,153,255,215,153,249,
      216,153,243,217,2812
D4    2240 DATA 153,237,218,136,20
      8,224,96,31,216,243,65,29,25
      4,65,17,18,2210
70    2250 DATA 66,157,32,66,145,4
      9,66,136,64,66,32,137,66,87,
      168,66,1403
5B    2260 DATA 72,189,66,13,220,6
      6,19,231,66,147,243,66,20,29
      ,67,148,1662
85    2270 DATA 79,67,18,116,57,77
      ,161,67,43,181,67,45,208,67,
      82,225,1570
15    2280 DATA 67,80,52,68,66,225
      ,68,67,161,68,68,9,70,71,25,
      69,1234
D7    2290 DATA 69,83,69,73,36,71,
      76,172,69,83,219,69,88,130,6
      9,77,1453
11    2300 DATA 161,67,51,0,5,15,6
      7,79,78,84,82,79,76,32,78,79
      ,1033
B6    2310 DATA 87,32,65,84,20,76,
      69,70,84,26,82,73,71,72,84,3
      3,1029
21    2320 DATA 87,73,78,68,79,97,
```

```
    61,80,82,69,83,83,32,83,80,6
    5,1190
3F  2330 DATA 67,69,32,66,65,82,
    32,84,79,32,67,79,78,84,73,7
    8,1067
76  2340 DATA 85,69,77,87,72,55,
    84,32,68,73,82,69,67,84,73,7
    9,1166
3C  2350 DATA 78,63,82,70,82,79,
    77,85,84,79,96,67,72,65,82,6
    5,1225
43  2350 DATA 67,84,69,82,63,101
    ,67,79,80,89,107,69,82,65,83
    ,69,1256
C1  2370 DATA 112,71,79,84,79,12
    4,80,92,69,83,83,32,70,49,32
    ,84,1213
F2  2380 DATA 79,141,83,69,69,32
    ,73,78,83,84,82,85,67,84,73,
    79,1251
EF  2390 DATA 78,83,152,70,73,76
    ,69,32,78,65,77,69,63,165,69
    ,73,1292
0C  2400 DATA 83,67,32,79,82,32,
    84,65,80,69,63,171,76,79,65,
    68,1195
5E  2410 DATA 176,83,65,86,69,19
    1,69,88,73,84,201,85,80,8C,8
    9,82,1571
57  2420 DATA 32,79,82,32,76,79,
    87,69,82,32,83,69,84,63,215,
    68,1232
84  2430 DATA 65,84,65,32,84,79,
    32,66,65,83,73,67,133,39,160
    ,0,1127
FC  2440 DATA 177,251,145,253,16
    5,251,197,38,208,6,165,252,1
    97,39,240,14,2598
5F  2450 DATA 230,251,208,2,230,
    252,230,253,208,230,230,254,
    208,226,96,133,3241
B8  2460 DATA 252,169,136,120,13
    3,254,169,0,133,251,133,253,
    169,255,133,38,2598
F0  2470 DATA 169,43,133,1,169,2
    15,32,0,112,169,47,133,1,88,
    96,24,1432
32  2480 DATA 173,11,96,105,4,14
    1,11,96,173,25,208,41,1,208,
    3,76,1372
B6  2490 DATA 126,234,165,2,240,
    25,169,2,141,24,208,169,1,14
    1,25,208,1880
32  2500 DATA 198,2,169,1,141,18
    ,208,169,27,141,17,208,76,12
    6,234,169,1904
89  2510 DATA 9,141,24,208,169,1
    ,141,25,208,133,2,169,185,14
    1,18,208,1782
4D  2520 DATA 169,27,141,17,208,
    76,125,234,120,169,67,141,20
    ,3,169,112,1799
AD  2530 DATA 141,21,3,169,1,141
    ,26,208,133,2,169,185,141,18
    ,208,169,1735
1C  2540 DATA 27,141,17,208,88,9
    6,120,169,49,141,20,3,169,23
    4,141,21,1644
A7  2550 DATA 3,169,240,141,25,2
    08,169,8,141,24,208,88,96,32
    ,159,255,1967
4F  2560 DATA 32,228,255,240,248
    ,96,32,193,112,201,32,208,24
    9,32,170,112,2440
53  2570 DATA 169,0,141,21,208,1
    69,47,133,1,96,169,103,133,2
    51,169,128,1938
A5  2580 DATA 133,252,162,136,16
    0,0,138,145,251,200,232,240,
    17,192,15,208,2481
DD  2590 DATA 245,24,165,251,105
    ,40,133,251,144,234,230,252,
    208,230,96,160,2768
F6  2600 DATA 0,145,251,166,251,
    228,253,208,6,166,252,229,25
    4,240,8,230,2886
AA  2610 DATA 251,208,238,230,25
    2,208,234,96,162,0,169,64,13
    3,251,169,164,2829
1A  2620 DATA 133,252,189,0,97,3
    2,70,113,160,7,177,253,145,2
    51,136,16,2031
35  2630 DATA 249,24,165,251,105
    ,8,133,251,144,2,230,252,232
    ,224,120,208,2598
CE  2640 DATA 225,96,133,253,169
    ,17,133,254,160,3,165,253,10
    ,133,253,165,2422
59  2650 DATA 254,42,133,254,136
    ,208,243,96,169,82,133,251,1
    69,128,133,252,2583
D8  2660 DATA 173,0,96,32,70,113
    ,160,0,177,253,133,255,152,7
    2,160,0,1846
A5  2670 DATA 165,255,10,133,255
    ,144,4,169,86,208,2,169,32,1
    45,251,200,2229
9A  2680 DATA 192,8,208,236,104,
    168,24,165,251,105,40,133,25
    1,144,2,230,2251
25  2690 DATA 252,200,192,8,208,
    210,96,185,1,96,72,185,2,96,
    157,0,1960
A4  2700 DATA 0,169,0,160,3,157,
    1,0,189,0,0,10,157,0,0,189,1
    035
DB  2710 DATA 1,0,42,157,1,0,136
    ,208,239,160,4,189,0,0,133,2
    51,1521
56  2720 DATA 189,1,0,133,252,16
    5,251,117,0,157,0,0,165,252,
    117,1,1800
67  2730 DATA 157,1,0,136,208,23
    9,104,117,0,149,0,144,2,246,
    1,96,1600
0B  2740 DATA 173,1,96,170,169,0
    ,56,106,202,16,252,133,255,1
    73,0,96,1898
E9  2750 DATA 32,70,113,172,2,96
    ,177,253,96,160,14,173,4,96,
    133,255,1846
50  2760 DATA 24,101,255,136,208
    ,251,109,3,96,168,96,169,135
    ,133,251,169,2304
42  2770 DATA 128,133,252,169,10
    0,133,38,169,10,133,39,169,1
    ,133,40,160,1807
42  2780 DATA 0,173,0,96,162,255
    ,133,255,56,165,255,249,38,0
    ,232,176,2245
43  2790 DATA 245,138,105,48,145
    ,251,200,165,255,192,3,208,2
    31,96,169,168,2619
12  2800 DATA 133,251,169,218,13
    3,252,162,8,160,5,169,7,145,
    251,136,16,2215
BC  2810 DATA 251,160,38,145,251
    ,160,39,145,251,24,165,251,1
    05,40,133,251,2409
97  2820 DATA 144,2,230,252,202,
    208,225,160,40,169,7,153,127
    ,219,136,208,2491
43  2830 DATA 250,96,173,12,96,2
    08,83,173,0,96,32,70,113,56,
    169,8,1635
A8  2840 DATA 237,1,96,170,169,0
    ,56,42,202,16,252,133,255,17
    2,2,96,1899
70  2850 DATA 56,233,1,133,252,4
    9,253,133,251,56,165,38,240,
    2,229,252,2343
1F  2850 DATA 229,255,49,253,133
    ,252,165,251,166,38,240,4,10
    ,76,181,114,2416
03  2870 DATA 74,5,252,145,253,5
    6,165,38,240,8,173,1,96,240,
    3,206,1955
16  2880 DATA 1,96,32,92,113,32,
    28,113,169,0,96,56,169,15,23
    7,3,1252
11  2890 DATA 96,170,160,14,173,
    4,96,133,255,24,101,255,136,
    208,251,96,2172
B3  2900 DATA 169,103,133,251,16
    9,216,133,252,162,8,160,14,1
    69,8,145,251,2343
F4  2910 DATA 136,16,251,24,165,
    251,105,40,133,251,144,2,230
    ,252,202,208,2410
01  2920 DATA 233,76,66,114,24,7
    2,32,240,255,104,170,169,0,2
    02,240,7,2004
A8  2930 DATA 168,185,96,98,202,
    208,249,170,168,185,96,98,13
    3,255,232,228,2771
13  2940 DATA 255,240,9,189,96,9
    8,32,210,255,76,34,115,95,16
    0,160,169,2194
8C  2950 DATA 32,153,223,129,136
    ,208,250,96,162,12,160,0,133
    ,44,169,1,1908
81  2960 DATA 32,8,115,162,12,16
    0,15,24,173,12,96,105,2,32,8
    ,115,1071
49  2970 DATA 24,169,20,109,12,9
    6,168,169,4,162,12,32,8,115,
    162,15,1277
19  2980 DATA 32,129,115,176,21,
    173,12,96,208,9,238,12,96,16
    9,14,133,1633
E6  2990 DATA 44,208,7,206,12,96
    ,169,7,133,44,76,49,115,169,
    5,160,1500
A3  3000 DATA 0,32,8,115,32,193,
    112,201,32,240,5,201,3,208,2
    45,24,1651
89  3010 DATA 95,169,32,32,210,2
    55,162,0,32,87,116,134,41,32
    ,193,112,1703
1B  3020 DATA 166,41,201,3,240,2
    34,201,64,176,241,201,13,240
    ,32,201,20,2274
59  3030 DATA 240,18,201,48,144,
    229,224,3,240,225,32,210,255
    ,232,32,87,2420
BA  3040 DATA 116,76,166,115,224
    ,0,240,211,32,210,255,202,16
    ,240,224,0,2327
67  3050 DATA 240,201,169,32,32,
    210,255,169,1,133,38,169,10,
    133,39,169,2000
63  3060 DATA 100,133,40,162,4,1
    69,157,32,210,255,202,208,24
    8,169,3,170,2262
AB  3070 DATA 168,32,186,255,169
    ,0,32,189,255,32,192,255,162
    ,3,32,198,2160
4C  3080 DATA 255,169,0,133,255,
    160,2,132,42,32,228,255,164,
    42,56,233,2158
07  3090 DATA 48,153,251,0,136,1
    6,240,169,3,32,195,255,32,20
    4,255,169,2158
05  3100 DATA 0,166,41,149,251,2
    32,224,5,208,249,162,2,189,2
    51,0,240,2369
B4  3110 DATA 13,169,24,165,255,
    117,38,133,255,176,11,136,20
    8,245,202,16,2162
6F  3120 DATA 235,165,255,162,1,
    96,162,3,169,20,32,210,255,2
    02,208,248,2423
C7  3130 DATA 76,154,115,169,219
    ,32,210,255,169,157,76,210,2
    55,133,42,162,2434
66  3140 DATA 12,160,0,32,8,115,
    165,42,160,5,201,7,240,2,160
    ,3,1312
83  3150 DATA 162,12,169,16,32,8
```

```
    ,115,32,193,112,201,3,208,3,
    76,49,1391
7B  3160 DATA 115,201,68,240,8,2
    01,84,208,239,169,1,208,2,16
    9,8,141,2061
C1  3170 DATA 254,101,32,49,115,
    169,15,162,12,160,0,32,8,115
    ,169,32,1425
07  3180 DATA 32,210,255,162,0,3
    2,87,115,134,38,32,193,112,1
    65,38,201,1808
3E  3190 DATA 3,240,203,201,13,2
    40,39,201,20,240,25,201,32,1
    44,233,201,2236
B8  3200 DATA 128,176,229,224,15
    ,240,225,32,210,255,157,0,10
    2,232,32,87,2344
08  3210 DATA 115,76,172,115,224
    ,0,240,208,32,210,255,202,16
    ,240,224,0,2331
7E  3220 DATA 240,198,142,255,10
    1,169,32,32,210,255,169,13,1
    62,15,160,0,2153
C3  3230 DATA 32,8,115,24,165,42
    ,105,10,162,15,160,12,32,8,1
    15,32,1037
5E  3240 DATA 193,112,201,3,240,
    8,201,133,208,245,32,124,117
    ,96,76,49,2038
FE  3250 DATA 115,162,12,160,0,3
    2,8,115,169,32,32,210,255,16
    2,7,32,1503
90  3260 DATA 15,115.169,32,32,2
    10,255,162,9,32,15,115,32,14
    9,115,240,1697
38  3270 DATA 34,133,43,32,70,11
    3,165,253,133,61,165,254,133
    ,62,169,8,1828
CC  3280 DATA 162,14,160,0,32,8,
    115,169,9,162,14,160,3,32,8,
    115,1163
29  3290 DATA 76,149,115,96,173,
    255,101,166,185,224,1,240,9,
    24,105,2,1922
DC  3300 DATA 162,254,160,101,20
    8,4,162,0,160,102,32,189,255
    ,169,64,141,2163
BC  3310 DATA 254,101,169,58,141
    ,255,101,96,32,170,112,76,23
    1,255,0,0,2051
39  3320 DATA 169,0,133,250,169,
    112,133,251,169,1,133,174,13
    3,193,169,8,2197
70  3330 DATA 133,175,133,194,15
    9,112,133,252,169,132,133,25
    3,160,0,177,250,2575
D4  3340 DATA 145,174,230,250,20
    8,2,230,251,230,174,208,2,23
    0,175,165,250,2924
C3  3350 DATA 197,252,208,234,16
    5,251,197,253,208,228,169,11
    ,133,187,169,133,2995
7D  3360 DATA 133,188,169,11,133
    ,183,169,0,133,185,160,0,185
    ,219,132,240,2240
CF  3370 DATA 6,32,210,255,200,2
    08,245,32,207,255,240,251,20
    1,49,240,4,2535
59  3380 DATA 201,55,48,230,41,1
    5,133,186,76,234,245,147,17,
    17,73,78,1797
87  3390 DATA 80,85,84,32,58,69,
    86,73,67,69,32,78,85,77,66,6
    9,1120
55  3400 DATA 82,13,17,67,65,83,
    61,49,32,47,32,68,73,83,75,6
    1,908
BC  3410 DATA 32,56,32,79,82,32,
    57,58,45,32,0,67,72,65,82,32
    ,823
0A  3420 DATA 69,68,73,84,79,82,
    0,0,0,0,0,255,255,255,255,0,
    1475
```

## Mastering Raster

```
10                      ;MASTERING
20                      ;THE
30                      ;RASTER
40                      ;
50                      ;EXAMPLE 2 :-
60                      ;3 BACKGROUNDS
70                      ;
80 VIC                  =$D000
90 RASTER               =VIC+18
100 RASTERHI            =VIC+17
110 IRR                 =VIC+25
120 IMR                 =VIC+26
130 IRQVEC              =$0314
140 IRQOLD              =$EA31
150 LINE1               =0
160 LINE2               =100
170 LINE3               =200
180 COLOR1              =5
190 COLOR2              =1
200 COLOR3              =8
210                     ;
220                     *=$C000
230                     ;
240 INIT                SEI
250                     LDA #LINE1          ;SET RASTER
260                     STA RASTER          ;LINE
270                     LDA RASTERHI        ;REMEMBERING TO
280                     AND #%01111111      ;ERASE THE
290                     STA RASTERHI        ;HI BIT
300                     LDA #%10000001      ;INTERRUPT BY
310                     STA IMR             ;RASTER LINE ONLY
320                     LDA #TEST&255
330                     STA IRQVEC
340                     LDA #TEST/256
350                     STA IRQVEC+1
360                     CLI
370                     RTS
380                     ;
390                     ;
400 TEST                LDA IRR             ;READ AND
410                     STA IRR             ;ERASE IRR
420                     AND #%00000001      ;IS RASTER SOURCE
430                     BNE ROUTINE         ;YES
440                     LDA $DC0D
450                     CLI
460                     JMP IRQOLD          ;NO
470                     ;
480 ROUTINE             LDA RASTER
490                     CMP #LINE2          ;CHECK IF
500                     BCS SECOND          ;RASTER>=LINE2
510                     ;
520 FIRST               LDA #COLOR1
530                     LDX #LINE2
540 COLOR
550                     STA 53280
560                     STA 53281
570                     STX RASTER
580                     ;
590                     PLA                 ;RESTORE REGS
600                     TAY
610                     PLA
620                     TAX
630                     PLA
640                     RTI
650                     ;
660                     ;
670 SECOND              CMP #LINE3
680                     BCS THIRD
690                     LDA #COLOR2
700                     LDX #LINE3
710                     JMP COLOR
720 THIRD               LDA #COLOR3
730                     LDX #LINE1
740                     JMP COLOR
```

```
10                      ;MASTERING
20                      ;THE
30                      ;RASTER
40                      ;
50                      ;EXAMPLE 2 :-
60                      ;16 SPRITES
70                      ;
80 VIC                  =$D000
90 RASTER               =VIC+18
100 RASTERHI            =VIC+17
110 IRR                 =VIC+25
120 IMR                 =VIC+26
130 IRQVEC              =$0314
140 IRQOLD              =$EA31
150 LINE1               =0
160 LINE2               =130
170 TABLE1              =$C100
180 TABLE2              =$C200
190                     ;
200                     *=$C000
210                     ;
220 INIT                SEI
230                     LDA #LINE1          ;SET RASTER
240                     STA RASTER          ;LINE
250                     LDA RASTERHI        ;REMEMBERING TO
260                     AND #%01111111      ;ERASE THE
270                     STA RASTERHI        ;HI BIT
```

```
280               LDA #%10000001     ;INTERRUPT BY
290               STA IMR            ;RASTER LINE ONLY
300               LDA #TEST&255
310               STA IRQVEC
320               LDA #TEST/256
330               STA IRQVEC+1
340               CLI
350               RTS
360               ;
370               ;
380 TEST          LDA IRR            ;READ AND
390               STA IRR            ;ERASE IRR
400               AND #%00000001     ;IS RASTER SOURCE
410               BNE ROUTINE        ;YES
420               LDA $DC0D
430               CLI
440               JMP IRQOLD         ;NO
450               ;
460 ROUTINE       LDA RASTER
470               CMP #LINE2         ;CHECK IF
480               BCS SECOND         ;RASTER>=LINE2
490               ;
500 FIRST         LDA #TABLE1&255
510               LDY #TABLE1/256
520               STA $FB
530               STY $FC
540               LDX #LINE2
550 COPY
560               LDY #0
570 LOOP          LDA ($FB),Y
580               STA VIC,Y
590               INY
600               CPY #16
610               BNE LOOP
620               STX RASTER
630               ;
640               PLA                ;RESTORE REGS
650               TAY
660 LIST          PLA
670               TAX
680               PLA
690               RTI
700               ;
710               ;
720 SECOND        LDA #TABLE2&255
730               LDY #TABLE2/256
740               STA $FB
750               STY $FC
760               LDX #LINE1
770               JMP COPY
```

## Creating Characters

LIST 1

```
>7000 80 80 80 80 80 80 00 00 :
>7008 80 80 80 DE 80 80 00 00 :
>7010 80 84 83 80 84 83 00 00 :
>7018 80 94 BE 94 BE 94 00 00 :
>7020 80 84 AA FF AA 90 00 00 :
>7028 80 B1 89 A4 A3 80 00 00 :
>7030 80 94 AA FF AA A2 00 00 :
>7038 80 80 80 84 83 80 00 00 :
>7040 80 9C A2 C1 80 80 00 00 :
>7048 80 80 C1 A2 9C 80 00 00 :
>7050 80 AA 9C BE 9C AA 00 00 :
>7058 80 88 88 BE 88 88 00 00 :
>7060 80 80 80 C0 B0 80 00 00 :
>7068 80 88 88 88 88 88 00 00 :
>7070 80 80 80 B0 B0 80 00 00 :
>7078 80 A0 90 88 84 82 00 00 :
>7080 80 9E B1 AD A3 9E 00 00 :
>7088 80 80 A2 BF A0 80 00 00 :
>7090 80 B2 A9 A9 A9 A6 00 00 :
>7098 80 91 A1 A1 A5 9B 00 00 :
>70A0 80 88 8C 8A BF 88 00 00 :
>70A8 80 97 A5 A5 A5 99 00 00 :
>70B0 80 9C A6 A5 A5 98 00 00 :
>70B8 80 81 81 B9 85 83 00 00 :
>70C0 80 9A A5 A5 A5 9A 00 00 :
>70C8 80 86 A9 A9 99 8E 00 00 :
>70D0 80 80 80 A4 A4 80 00 00 :
>70D8 80 80 80 C4 B4 80 00 00 :
>70E0 80 88 94 A2 A2 80 00 00 :
>70E8 80 94 94 94 94 94 00 00 :
>70F0 80 A2 A2 94 88 80 00 00 :
>70F8 80 82 81 A9 85 82 00 00 :
>7100 80 9E A1 AD A9 86 00 00 :
>7108 80 90 AA AA AA BC 00 00 :
>7110 80 BF A4 A2 A2 9C 00 00 :
>7118 80 9C A2 A2 A2 A2 00 00 :
>7120 80 9C A2 A2 A4 BF 00 00 :
>7128 80 9C AA AA AA 8C 00 00 :
>7130 80 80 84 BE 85 81 00 00 :
>7138 80 8C D2 D2 D2 BE 00 00 :
>7140 80 BF 84 82 82 BC 00 00 :
>7148 80 80 A4 BD A0 80 00 00 :
>7150 80 80 C0 C5 BD 80 00 00 :
>7158 80 BF 88 8C 92 A0 00 00 :
>7160 80 80 A1 BF A0 80 00 00 :
>7168 80 BE 82 BC 82 BC 00 00 :
>7170 80 BE 84 82 82 BC 00 00 :
>7178 80 9C A2 A2 A2 9C 00 00 :
>7180 80 FE 92 A2 A2 9C 00 00 :
>7188 80 9C A2 A2 92 FE 00 00 :
>7190 80 BE 84 82 82 84 00 00 :
>7198 80 A4 AA AA AA 90 00 00 :
>71A0 80 82 9F A2 A2 90 00 00 :
>71A8 80 9E A0 A0 A0 BE 00 00 :
>71B0 80 8E 90 A0 90 8E 00 00 :
>71B8 80 9E A0 98 A0 9E 00 00 :
>71C0 80 A2 B6 88 B6 A2 00 00 :
>71C8 80 8E D0 D0 D0 BE 00 00 :
>71D0 80 A2 B2 AA A6 A2 00 00 :
>71D8 80 80 FF C1 C1 80 00 00 :
>71E0 80 A8 BE A9 A9 A2 00 00 :
>71E8 80 80 C1 C1 FF 80 00 00 :
>71F0 80 80 82 BF 82 80 00 00 :
>71F8 80 88 9C 88 88 88 00 00 :
>7200 88 88 88 88 88 88 00 00 :
>7208 80 BC 8A 89 8A BC 00 00 :
>7210 80 A1 BF A5 A5 9A 00 00 :
>7218 80 9E A1 A1 A1 92 00 00 :
>7220 80 A1 BF A1 92 8C 00 00 :
>7228 80 A1 BF A5 A5 A1 00 00 :
>7230 80 A1 BF A5 85 81 00 00 :
>7238 80 9E A1 A1 A9 B9 00 00 :
>7240 80 BF 84 84 84 BF 00 00 :
>7248 80 80 A1 BF A1 80 00 00 :
>7250 80 90 A0 A1 9F 81 00 00 :
>7258 80 80 BF 8C 92 A1 00 00 :
>7260 80 A1 BF A1 A0 B0 00 00 :
>7268 80 BF 82 8C 82 BF 00 00 :
>7270 80 BF 82 84 88 BF 00 00 :
>7278 80 9E A1 A1 A1 9E 00 00 :
>7280 80 A1 BF A9 89 86 00 00 :
>7288 80 9E A1 A9 91 AE 00 00 :
>7290 80 A1 BF 89 99 A6 00 00 :
>7298 80 92 A5 A5 A5 98 00 00 :
>72A0 80 83 A1 BF A1 83 00 00 :
>72A8 80 9F A0 A0 A0 9F 00 00 :
>72B0 80 87 98 A0 98 87 00 00 :
>72B8 80 9F A0 9C A0 9F 00 00 :
>72C0 80 A1 B3 8C B3 A1 00 00 :
>72C8 80 83 A4 BC A4 83 00 00 :
>72D0 80 A3 B1 AD A3 B1 00 00 :
```

```
>72D8 88 88 88 FF 88 88 00 00 :
>72E0 00 55 2A 55 00 00 00 00 :
>72E8 00 00 00 00 7F 00 00 00 :
>72F0 00 04 3C 04 1C 02 00 00 :
>72F8 00 3E 41 5D 55 41 3E 00 :
```

LIST 2

```
>7530 A9 FF 85 37 A9 67 85 38 :
>7538 A9 00 8D 24 03 A9 76 8D :
>7540 25 03 20 F5 05 00 00 00 :
>7548 00 00 00 00 00 00 00 00 :
```

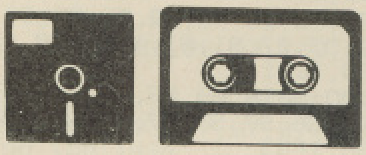
LIST 3

```
>7600 48 8A 48 A9 4B 8D 24 03 :
>7608 A9 EC 8D 25 03 A9 00 8D :
>7610 36 7A 8D 5E 3B A9 79 8D :
>7618 5F 3B A9 20 A2 00 9D A2 :
>7620 33 E8 E0 A7 D0 F8 A2 00 :
>7628 BD 3F 76 9D A2 33 F0 04 :
>7630 E8 4C 28 76 A9 80 8D 38 :
>7638 7A 68 AA 68 4C D2 FF 20 :
>7640 20 33 2D 50 4C 55 53 2D :
>7648 31 2E 20 41 4C 54 45 52 :
>7650 4E 41 54 49 56 45 20 46 :
>7658 4F 4E 54 2E 20 20 20 20 :
>7660 20 20 20 20 20 20 2E 20 :
>7668 20 20 20 20 20 20 20 20 :
>7670 20 20 20 20 20 20 20 20 :
>7678 20 20 20 20 20 20 20 20 :
>7680 20 20 20 20 20 20 20 20 :
>7688 20 20 20 20 20 20 20 20 :
>7690 20 46 52 41 4E 4B 20 43 :
>7698 41 52 53 4F 4E 2E 20 20 :
>76A0 20 28 4A 41 4E 20 31 39 :
>76A8 38 38 2E 29 00 00 00 00 :
```

LIST 4

```
>7900 20 42 79 A5 AE C9 04 D0 :
>7908 16 AD 3C 7A C9 0E F0 27 :
>7910 C9 0F F0 21 C9 01 F0 0D :
>7918 C9 02 F0 11 4C 56 79 20 :
>7920 4C 79 4C A8 FF A9 82 8D :
>7928 41 7A 4C 3A 79 A9 80 8D :
>7930 41 7A 4C 3A 79 A9 00 8D :
>7938 3F 7A 20 4C 79 A9 0F 4C :
>7940 A8 FF 8D 3C 7A 8E 3D 7A :
>7948 8C 3E 7A 60 AD 3C 7A AE :
>7950 3D 7A AC 3E 7A 60 C9 0D :
>7958 F0 2D A9 08 20 A8 FF AE :
>7960 40 7A 20 73 79 AD 3F 7A :
>7968 F0 03 20 73 79 8E 40 7A :
>7970 4C 08 7A AD 41 7A 9D 00 :
>7978 7B AD 3C 7A C9 20 D0 05 :
>7980 A9 80 9D 00 7B E8 60 A9 :
>7988 08 20 A8 FF A9 0D 20 A8 :
>7990 FF AD 40 7A F0 1D A2 FF :
>7998 E8 BD 00 7B 20 A8 FF 20 :
>79A0 A8 FF 20 A8 FF 20 A8 FF :
>79A8 20 A8 FF 20 A8 FF EC 40 :
>79B0 7A D0 E5 A9 00 8D 40 7A :
>79B8 A9 0D 20 A8 FF 4C 3A 79 :
>79C0 8D CE 79 AD 3C 7A 0A 0A :
>79C8 0A AA A0 06 BD 00 70 8D :
>79D0 42 7A E8 88 F0 14 AD 3F :
>79D8 7A F0 06 AD 42 7A 20 A8 :
>79E0 FF AD 42 7A 20 A8 FF 4C :
>79E8 CC 79 AD 3F 7A F0 06 AD :
>79F0 42 7A 20 A8 FF AD 42 7A :
>79F8 20 A8 FF AD 40 7A C9 50 :
>7A00 F0 85 4C 3A 79 8D 45 7A :
>7A08 A9 08 20 A8 FF AD 3C 7A :
>7A10 C9 40 90 07 C9 60 90 0E :
>7A18 4C 31 7A 38 E9 20 8D 42 :
>7A20 7A A9 70 4C C0 79 38 E9 :
>7A28 40 8D 42 7A A9 71 4C C0 :
>7A30 79 38 E9 80 8D 42 7A A9 :
>7A38 72 4C C0 79 00 00 00 00 :
>7A40 00 00 00 00 00 00 00 00 :
```

## William Tell



Here is the second installment of the on-going William Tell saga. As with last month's installment, keep the finished program somewhere safe until we reach the end in a month or so, when full assemblage instructions will be given.

PROGRAM: WT3.BAS

```
A9  10 BL=471   :LN=50    :SA=3276
    8
F9  20 FOR L=0 TO BL:CX=0:FOR D=
    0 TO 15
88  21 READ A:POKE53280,A
9E  22 CX=CX+A:POKE SA+L*16+D,A:
    NEXT
A2  30 READA:IF A=CX THEN40
12  31 PRINT"ERROR IN LINE";LN+(
    L*10):STOP
16  40 NEXT L:SYS40136
F4  50 DATA 97,94,100,85,100,81,
    65,73,74,65,73,74,66,65,84,6
    5,1261
37  60 DATA 65,65,97,96,100,86,1
    00,83,66,65,65,66,65,65,66,6
    5,1215
4B  70 DATA 84,66,65,66,97,95,92
    ,85,100,81,65,73,74,66,73,74
    ,1256
53  80 DATA 65,66,123,125,66,65,
    97,97,91,86,100,83,66,65,65,
    65,1325
49  90 DATA 65,65,66,66,124,126,
    65,66,97,97,90,85,100,81,65,
    66,1324
71  100 DATA 65,66,66,65,65,65,6
    5,65,66,66,97,90,100,86,87,8
    3,1197
2A  110 DATA 66,70,72,72,65,66,6
    5,73,74,74,65,66,94,100,100,
    100,1222
A9  120 DATA 83,87,66,69,71,71,6
    6,210,66,210,65,210,66,165,9
    5,92,1692
41  130 DATA 100,92,100,83,65,65
    ,65,65,210,210,210,210,210,2
    10,210,165,2270
AA  140 DATA 97,91,100,100,100,1
    00,122,32,32,61,208,208,208,
    208,208,208,2083
36  150 DATA 208,208,97,97,91,10
    0,92,100,41,32,32,60,65,66,6
    5,66,1420
83  160 DATA 66,66,65,66,97,97,9
    4,92,100,100,41,32,32,61,66,
    65,1140
E5  170 DATA 225,227,84,66,66,65
    ,97,97,95,100,92,92,122,77,7
    5,60,1640
97  180 DATA 65,66,226,230,65,65
    ,66,66,97,97,94,92,100,100,4
    1,78,1548
D1  190 DATA 32,61,66,65,66,165,
    84,66,65,65,97,97,96,100,100
    ,100,1325
82  200 DATA 122,32,32,60,66,66,
    210,165,66,210,66,66,97,97,9
    6,100,1551
30  210 DATA 100,100,122,32,32,6
    1,209,209,209,209,209,209,20
    9,209,97,97,2313
99  220 DATA 96,100,86,88,63,63,
    63,63,63,63,63,63,63,63,63,6
    3,1126
```

```
E0  230 DATA 97,97,95,93,85,82,63,63,63,63,63,63,63,63,63,63,1179
ED  240 DATA 63,63,97,97,90,100,86,83,83,66,84,66,84,84,66,84,1296
C6  250 DATA 84,66,84,66,97,94,100,100,85,81,66,73,74,165,73,74,1382
41  260 DATA 65,65,66,73,74,65,97,95,100,100,86,83,65,65,65,165,1329
C8  270 DATA 165,65,66,66,66,65,65,66,97,97,92,100,100,87,84,73,1354
4D  280 DATA 74,65,73,74,165,66,66,73,74,66,97,94,100,92,100,83,1362
A1  290 DATA 65,65,65,165,165,165,165,65,165,165,165,210,97,95,100,100,2017
7F  300 DATA 100,122,122,32,32,61,208,208,79,80,208,208,208,208,97,97,2070
EA  310 DATA 91,100,100,122,121,32,32,60,66,65,79,80,66,210,66,65,1355
56  320 DATA 97,97,94,92,100,41,122,32,32,61,65,66,79,80,84,65,1207
60  330 DATA 66,66,97,97,95,100,92,122,121,32,32,60,66,65,79,80,1270
DE  340 DATA 84,66,65,66,97,97,94,93,100,41,122,32,32,61,66,66,1182
9D  350 DATA 79,80,65,210,66,65,97,97,96,100,93,41,122,32,32,60,1335
26  360 DATA 65,66,79,80,66,65,66,66,97,97,95,93,100,122,121,32,1310
47  370 DATA 32,61,66,66,79,80,119,128,127,127,97,97,90,100,100,122,1491
6B  380 DATA 122,32,32,60,65,66,79,80,84,65,66,65,97,94,93,100,1200
14  390 DATA 100,122,122,32,32,61,66,65,79,80,65,66,66,66,97,96,1215
F8  400 DATA 100,100,100,41,121,32,32,60,65,66,79,80,84,65,66,65,1156
64  410 DATA 97,95,100,92,100,122,122,32,202,61,66,66,79,80,84,66,1464
F2  420 DATA 65,66,97,97,91,100,100,41,121,32,203,60,66,65,79,80,1363
B5  430 DATA 119,66,66,65,97,97,97,91,100,122,121,32,32,61,65,66,1297
BA  440 DATA 79,80,84,65,66,66,97,97,97,90,92,41,122,32,32,60,1200
D5  450 DATA 66,65,79,80,84,66,66,65,97,97,94,100,100,92,122,32,1305
10  460 DATA 32,61,66,66,79,80,84,128,127,127,97,97,96,100,100,100,1440
23  470 DATA 41,32,32,60,65,66,79,80,65,66,65,66,97,97,95,100,1106
90  480 DATA 92,100,122,32,32,61,66,66,79,80,119,66,65,65,97,97,1239
6D  490 DATA 97,91,100,100,41,32,32,60,66,65,79,80,65,65,66,66,1105
3B  500 DATA 97,97,97,90,100,100,122,32,32,61,65,65,79,80,84,65,1266
C2  510 DATA 65,65,97,97,94,100,100,100,41,32,32,60,66,65,79,80,1173
BA  520 DATA 84,66,65,66,97,97,95,92,100,100,41,32,32,61,65,66,1159
F1  530 DATA 79,80,119,66,66,65,97,97,97,91,93,100,122,32,32,60,1296
E6  540 DATA 66,65,79,80,65,66,65,66,97,97,97,90,93,100,41,32,1199
4A  550 DATA 32,61,66,66,79,80,84,65,66,65,97,97,90,93,100,100,1241
28  560 DATA 41,32,32,60,65,66,79,80,65,66,65,66,97,94,100,100,1108
0C  570 DATA 93,100,122,32,32,61,66,65,79,80,84,128,127,127,97,95,1388
D6  580 DATA 100,92,100,100,41,77,75,60,66,65,79,80,84,65,65,66,1215
4C  590 DATA 97,97,91,100,100,100,122,78,32,61,66,66,79,80,84,66,1319
72  600 DATA 66,65,97,97,97,91,92,100,122,32,32,60,65,65,79,80,1240
21  610 DATA 65,66,65,66,97,97,97,97,92,100,41,32,32,61,66,66,1140
20  620 DATA 79,80,119,66,66,65,97,97,97,90,100,92,41,32,32,60,1213
EF  630 DATA 65,66,79,80,65,65,66,66,97,97,94,100,100,100,41,32,1213
2C  640 DATA 32,61,66,65,79,80,84,66,65,65,97,97,96,92,100,100,1245
25  650 DATA 122,32,32,60,66,65,79,80,65,66,66,66,97,97,96,100,1189
13  660 DATA 100,100,41,32,202,61,65,66,79,80,84,128,127,127,97,97,1486
AB  670 DATA 96,93,93,100,122,32,203,60,66,66,79,80,84,66,65,66,1371
F9  680 DATA 97,97,95,93,100,100,122,32,32,61,65,66,79,80,65,66,1250
F1  690 DATA 66,65,97,97,90,100,100,100,114,32,32,60,66,65,79,80,1243
2D  700 DATA 119,66,65,66,97,94,100,100,100,100,111,112,32,61,209,209,1641
C7  710 DATA 79,80,209,209,209,209,97,95,92,100,100,155,100,116,119,120,2089
CC  720 DATA 108,108,105,80,108,108,108,108,97,97,91,100,155,115,115,117,1720
95  730 DATA 109,109,109,109,109,106,109,109,109,109,97,157,159,155,115,115,1885
65  740 DATA 115,117,73,74,109,109,109,106,109,70,72,109,97,158,161,156,1744
7A  750 DATA 115,115,115,117,109,109,109,70,72,106,109,69,71,109,97,97,1589
44  760 DATA 90,100,156,115,115,117,109,109,109,69,71,106,109,109,109,109,1702
B9  770 DATA 97,94,100,100,100,156,115,118,73,74,104,104,104,107,104,104,1654
79  780 DATA 104,104,97,95,100,92,100,100,113,114,32,60,66,66,79,80,1402
F7  790 DATA 84,66,66,66,97,97,91,100,92,93,112,32,32,61,65,66,1220
53  800 DATA 79,80,119,66,65,66,97,97,96,100,93,100,112,32,32,60,1294
28  810 DATA 66,65,79,80,84,66,66,65,97,97,95,93,100,100,114,32,1299
CF  820 DATA 32,61,66,66,79,80,84,128,127,127,97,97,90,100,47,27,1308
D8  830 DATA 28,59,32,60,65,65,79,80,84,65,66,66,97,94,93,100,1133
06  840 DATA 100,43,42,0,32,61,66,65,79,80,65,66,66,65,97,96,1023
E3  850 DATA 100,100,100,44,46,0,32,60,65,66,79,80,84,65,66,66,1053
6D  860 DATA 97,95,100,92,100,44,46,0,32,61,66,66,79,80,119,66,1143
7D  870 DATA 65,66,97,97,91,100,100,44,30,33,32,60,66,65,79,80,1105
CC  880 DATA 84,66,66,65,97,97,97,91,100,44,46,0,32,61,65,66,1077
CE  890 DATA 79,80,84,65,66,66,97,97,97,90,47,29,46,0,32,60,1035
BE  900 DATA 66,65,79,80,84,66,66,65,97,97,94,100,100,43,42,0,1144
F1  910 DATA 32,61,66,66,79,80,84,128,127,127,97,97,96,93,100,100,1433
AD  920 DATA 76,0,32,60,65,66,79,80,65,66,65,65,97,97,95,100,1108
33  930 DATA 92,100,112,32,32,61,66,66,79,80,119,66,65,66,97,97,1230
2A  940 DATA 97,91,100,100,114,32,32,60,66,65,79,80,65,65,66,66,1178
0F  950 DATA 97,97,97,90,100,100,112,32,32,61,65,65,79,80,84,65,1256
BA  960 DATA 65,65,97,97,94,100,100,100,122,32,32,60,66,65,79,80,1254
5D  970 DATA 84,66,65,66,97,97,95,92,100,100,41,32,32,61,65,66,1159
29  980 DATA 79,80,84,66,66,65,97,97,97,91,93,100,122,32,32,60,1261
6C  990 DATA 66,65,79,80,119,66,65,66,97,97,97,90,93,100,41,32,1253
B7  1000 DATA 32,61,66,66,79,80,66,65,66,65,97,97,90,93,100,100,1223
7E  1010 DATA 122,32,32,60,65,66,79,80,65,66,65,66,97,94,100,100,1189
69  1020 DATA 93,100,122,32,32,61,66,65,79,80,84,128,127,127,97,95,1388
62  1030 DATA 100,92,100,100,41,32,32,60,66,65,79,80,84,65,65,66,1127
CB  1040 DATA 97,97,91,100,100,100,122,32,32,61,66,66,79,80,84,66,1273
EC  1050 DATA 66,65,97,97,97,91,100,93,41,32,32,60,65,65,79,80,1160
B9  1060 DATA 65,66,65,66,97,97,97,97,93,100,41,32,202,61,66,66,1311
```

```
16 1070 DATA 79,80,119,66,66,65,97,97,97,90,100,100,122,32,203,60,1473
9A 1080 DATA 65,66,79,80,65,65,66,66,97,97,90,93,100,100,41,32,1202
32 1090 DATA 32,61,66,65,79,80,84,66,65,65,97,90,93,100,100,100,1243
F5 1100 DATA 41,32,32,60,66,66,79,80,65,66,66,66,94,100,100,100,1113
36 1110 DATA 100,100,122,32,32,61,65,65,79,80,84,128,127,127,95,92,1389
43 1120 DATA 100,100,100,100,122,32,32,60,66,66,79,80,84,66,65,66,1218
55 1130 DATA 97,91,100,100,100,100,41,32,32,61,65,66,79,80,65,66,1175
9A 1140 DATA 66,65,97,97,92,100,100,100,41,32,32,60,66,210,79,80,1317
0B 1150 DATA 119,66,210,66,97,94,100,92,86,88,63,63,63,103,209,209,1728
57 1160 DATA 79,80,209,209,209,209,97,95,92,100,85,82,63,63,63,63,1798
85 1170 DATA 63,63,103,80,63,63,63,63,97,97,91,100,86,83,84,64,1263
B2 1180 DATA 64,64,64,64,64,80,64,64,64,64,97,97,97,91,85,81,1204
67 1190 DATA 65,73,74,65,123,125,65,80,66,73,74,65,97,97,97,90,1329
3C 1200 DATA 86,83,66,65,65,66,124,126,66,80,66,65,65,66,97,97,1283
B6 1210 DATA 94,100,100,87,66,73,74,66,210,65,66,80,65,73,74,66,1359
66 1220 DATA 97,97,96,100,93,83,65,65,65,65,210,210,65,80,210,210,1811
C2 1230 DATA 210,210,97,97,95,93,100,100,41,32,32,60,208,208,79,80,1742
23 1240 DATA 208,208,208,208,97,97,94,100,100,100,122,32,32,61,65,66,1798
C1 1250 DATA 79,80,119,66,65,66,97,97,96,100,93,100,122,32,32,60,1304
E8 1260 DATA 66,65,79,80,84,66,66,65,97,97,95,93,100,100,41,32,1226
C0 1270 DATA 32,61,66,66,79,80,84,128,127,127,97,97,90,100,100,100,1434
B5 1280 DATA 122,77,75,60,65,65,79,80,84,65,66,66,97,94,93,100,1288
8C 1290 DATA 100,100,41,78,32,61,66,65,79,80,65,66,66,65,97,96,1157
2C 1300 DATA 100,100,100,100,41,32,32,60,65,66,79,80,84,65,66,66,1136
2C 1310 DATA 97,95,100,92,100,100,122,32,32,61,66,66,79,80,119,66,1307
92 1320 DATA 65,66,97,97,91,100,100,100,122,32,202,60,66,65,79,80,1422
5A 1330 DATA 65,66,66,65,97,97,97,91,100,100,41,32,203,61,65,66,1312
C6 1340 DATA 79,80,84,65,66,66,97,97,97,90,92,100,122,32,32,60,1259
20 1350 DATA 66,65,79,80,84,66,66,65,97,97,94,100,100,100,41,32,1232
3D 1360 DATA 32,61,66,66,79,80,84,128,127,127,97,97,96,93,100,100,1433
6B 1370 DATA 122,32,32,60,65,66,79,80,119,66,65,65,97,97,95,100,1240
9D 1380 DATA 92,100,41,32,32,61,66,66,79,80,66,66,65,66,97,97,1106
B5 1390 DATA 97,91,100,100,41,32,32,60,66,65,79,80,65,65,66,66,1105
47 1400 DATA 97,97,97,90,100,100,41,32,32,61,65,65,79,80,65,65,1166
46 1410 DATA 65,65,97,97,94,100,100,100,122,32,32,60,66,65,79,80,1254
34 1420 DATA 84,66,65,66,97,97,95,92,100,100,122,32,32,61,65,66,1240
3B 1430 DATA 79,80,84,66,66,65,97,97,97,91,92,100,41,32,32,60,1179
A0 1440 DATA 66,65,79,80,119,66,65,66,97,97,97,90,100,92,41,32,1252
F7 1450 DATA 32,61,66,66,79,80,210,65,66,65,97,97,90,93,100,100,1367
7A 1460 DATA 122,32,32,60,65,66,79,80,65,66,65,66,97,94,100,100,1189
2A 1470 DATA 93,100,41,32,32,61,66,65,79,80,84,128,127,127,97,95,1307
AA 1480 DATA 100,92,100,100,41,32,202,60,66,65,79,80,65,65,65,66,1278
34 1490 DATA 97,97,91,100,100,100,122,32,203,61,66,66,79,80,66,65,1425
9B 1500 DATA 66,65,97,97,97,91,92,100,122,32,32,60,65,65,79,80,1240
D7 1510 DATA 65,66,65,66,97,97,97,97,91,100,41,32,32,61,66,66,1139
F2 1520 DATA 79,80,119,66,66,65,97,97,97,97,90,92,114,32,32,60,1283
5C 1530 DATA 65,66,79,80,210,65,66,66,97,97,97,90,100,100,112,32,1422
74 1540 DATA 32,61,66,65,79,80,84,66,65,65,97,97,94,92,100,100,1243
3A 1550 DATA 114,77,75,60,66,66,79,80,65,66,66,66,97,97,96,100,1270
C9 1560 DATA 100,100,112,78,32,61,65,65,79,80,84,128,127,127,97,97,1432
1B 1570 DATA 96,93,93,100,114,32,32,60,66,66,79,80,84,66,65,66,1192
2C 1580 DATA 97,97,95,93,100,100,114,32,32,61,65,66,79,80,119,66,1296
43 1590 DATA 66,65,97,97,90,100,100,100,114,32,32,60,66,210,79,80,1388
F9 1600 DATA 210,66,210,66,97,94,100,100,86,88,63,63,63,103,209,209,1827
83 1610 DATA 79,80,209,209,209,209,97,95,92,100,85,82,63,63,63,63,1798
11 1620 DATA 63,63,103,80,63,63,63,63,97,97,91,100,86,83,84,64,1263
26 1630 DATA 64,64,64,64,64,80,64,64,64,64,97,97,97,91,85,81,1204
4B 1640 DATA 65,73,74,65,66,65,66,80,84,65,66,65,97,97,97,90,1215
65 1650 DATA 86,83,66,65,65,66,210,66,66,98,98,98,98,98,97,97,1457
D0 1660 DATA 94,100,100,87,66,73,74,66,210,66,210,99,99,99,99,99,1641
23 1670 DATA 97,97,95,100,100,83,65,65,65,65,210,210,210,80,210,210,1962
92 1680 DATA 210,210,97,97,97,92,100,100,114,32,32,60,208,208,79,80,1816
36 1690 DATA 208,208,208,208,97,97,94,100,92,93,114,32,32,61,65,66,1775
57 1700 DATA 79,80,65,66,65,66,97,97,96,100,93,100,112,32,32,60,1240
DB 1710 DATA 66,65,79,80,119,66,66,65,97,97,95,93,100,93,114,32,1327
74 1720 DATA 32,61,66,66,79,80,84,128,127,127,97,97,90,100,100,100,1434
EE 1730 DATA 114,32,32,60,65,210,79,80,84,65,66,66,97,94,93,100,1337
88 1740 DATA 100,100,112,32,32,61,66,65,79,80,65,66,66,65,97,96,1182
67 1750 DATA 100,100,92,100,112,32,32,60,65,66,79,80,84,65,66,66,1199
8B 1760 DATA 97,95,100,92,100,100,114,32,32,61,66,66,79,80,84,66,1264
B3 1770 DATA 65,66,97,97,91,100,100,100,114,32,32,60,66,65,79,80,1244
E2 1780 DATA 119,66,66,65,97,97,97,91,100,100,114,32,202,61,65,66,1438
12 1790 DATA 79,80,84,65,66,66,97,97,97,90,92,100,112,32,203,60,1420
BC 1800 DATA 66,65,79,80,84,66,66,65,97,97,94,100,100,100,114,32,1305
B9 1810 DATA 32,61,66,66,79,80,84,128,127,127,97,97,96,93,100,100,1433
58 1820 DATA 114,32,32,60,65,66,79,80,65,66,65,65,97,97,95,100,1178
23 1830 DATA 92,100,114,32,32,61,66,66,79,80,119,66,65,66,97,97,1232
22 1840 DATA 97,91,100,100,112,32,32,60,66,65,79,80,65,65,66,66,1176
17 1850 DATA 97,97,97,90,100,100,122,32,32,61,65,65,79,80,84,65,1266
5E 1860 DATA 65,65,97,97,94,100,100,100,41,32,32,60,66,65,79,80,1173
C5 1870 DATA 84,66,65,66,97,97,95,92,100,100,41,32,32,61,65,66,1159
EC 1880 DATA 79,80,119,66,66,65,97,97,97,91,92,100,122,32,32,60,1295
16 1890 DATA 66,65,79,80,65,66,65,66,97,97,97,90,93,100,122,32,1280
67 1900 DATA 32,61,66,66,79,80,84,65,66,65,97,97,90,93,100,100,1241
```

```
55  1910 DATA 41,32,32,60,65,66,
    79,80,65,66,65,66,97,94,100,
    100,1108
46  1920 DATA 100,100,122,32,32,
    61,66,65,79,80,84,128,127,12
    7,97,95,1395
12  1930 DATA 100,92,100,100,41,
    32,202,60,66,65,79,80,84,65,
    65,66,1297
DC  1940 DATA 97,97,91,100,100,1
    00,41,32,203,61,66,66,79,80,
    84,66,1363
2F  1950 DATA 66,65,97,97,97,91,
    92,100,122,32,32,60,65,65,79
    ,80,1240
EE  1960 DATA 65,66,65,66,97,97,
    97,97,92,100,41,32,32,61,66,
    66,1140
2C  1970 DATA 79,80,119,66,66,65
    ,97,97,97,90,100,92,122,32,3
    2,60,1294
67  1980 DATA 65,66,79,80,65,65,
    66,66,97,97,94,100,100,100,1
    22,32,1294
BF  1990 DATA 32,61,66,65,79,80,
    84,66,65,65,97,97,95,92,100,
    100,1244
BB  2000 DATA 41,32,32,60,66,66,
    79,80,65,66,66,66,97,97,97,9
    1,1101
65  2010 DATA 100,100,41,32,32,6
    1,65,65,79,80,84,128,127,127
    ,97,97,1315
D7  2020 DATA 97,97,93,100,122,3
    2,32,60,66,66,79,80,84,66,65
    ,66,1205
15  2030 DATA 97,97,97,90,100,10
    0,41,32,32,61,65,66,79,80,65
    ,66,1168
8E  2040 DATA 66,65,97,97,90,100
    ,93,100,114,32,32,60,66,210,
    79,80,1381
ED  2050 DATA 119,66,210,66,97,9
    4,100,100,100,100,111,112,32
    ,61,209,209,1786
E1  2060 DATA 79,80,209,209,209,
    209,97,95,92,100,100,155,115
    ,116,119,120,2104
89  2070 DATA 108,119,120,80,108
    ,108,108,108,97,97,91,100,15
    5,115,115,117,1746
B9  2080 DATA 109,109,109,109,10
    9,106,109,109,109,109,97,157
    ,159,155,115,115,1885
C5  2090 DATA 115,117,73,74,109,
    73,74,106,109,73,74,109,97,1
    58,161,156,1678
BF  2100 DATA 115,115,115,117,10
    9,109,109,109,109,106,109,10
    9,109,109,97,97,1743
BF  2110 DATA 90,100,156,115,115
    ,117,109,109,109,109,109,106
    ,109,109,109,109,1780
22  2120 DATA 97,94,100,100,100,
    156,115,118,73,74,104,73,74,
    107,104,73,1562
BC  2130 DATA 74,104,97,95,100,9
    2,100,100,113,114,32,60,66,6
    6,79,80,1372
75  2140 DATA 84,66,66,66,97,97,
    91,100,100,100,112,32,32,61,
    65,66,1235
C8  2150 DATA 79,80,119,66,65,66
    ,97,97,96,92,100,100,112,77,
    75,60,1381
22  2160 DATA 66,65,79,80,84,66,
    66,65,97,97,95,93,92,100,114
    ,78,1337
48  2170 DATA 32,61,66,66,79,80,
    84,128,127,127,97,97,90,100,
    100,100,1434
AB  2180 DATA 112,32,32,60,65,21
    0,79,80,84,65,66,66,97,94,10
    0,100,1342
AE  2190 DATA 100,100,122,32,32,
    61,66,65,79,80,65,66,66,65,9
    7,96,1192
1B  2200 DATA 100,100,100,100,12
    2,32,32,60,65,66,79,80,84,65
    ,66,66,1217
BC  2210 DATA 97,95,100,92,100,1
    00,41,32,202,61,66,66,79,80,
    119,66,1396
11  2220 DATA 65,66,97,97,91,100
    ,100,100,122,32,203,60,66,65
    ,79,80,1423
57  2230 DATA 84,66,66,65,97,97,
    97,91,100,100,122,32,32,61,6
    5,66,1241
85  2240 DATA 79,80,84,65,66,66,
    97,97,97,90,92,100,41,32,32,
    60,1178
74  2250 DATA 66,65,79,80,84,66,
    66,65,97,97,94,93,100,100,12
    2,32,1306
F7  2260 DATA 32,61,66,66,79,80,
    84,128,127,127,97,97,96,100,
    100,100,1440
CE  2270 DATA 41,32,32,60,65,66,
    79,80,65,66,65,65,97,97,95,1
    00,1105
89  2280 DATA 92,100,41,32,32,61
    ,66,66,79,80,119,66,65,66,97
    ,97,1159
40  2290 DATA 97,91,100,100,41,3
    2,32,60,66,65,79,80,65,65,66
    ,66,1105
92  2300 DATA 97,97,97,90,100,10
    0,122,32,32,61,65,65,79,80,8
    4,65,1266
8E  2310 DATA 65,65,97,97,94,100
    ,100,100,122,32,32,60,66,65,
    79,80,1254
DD  2320 DATA 84,66,65,66,97,97,
    95,92,100,93,41,32,32,61,65,
    66,1152
18  2330 DATA 79,80,119,66,66,65
    ,97,97,97,91,93,100,122,32,3
    2,60,1296
7B  2340 DATA 66,65,79,80,65,66,
    65,66,97,97,97,90,93,100,41,
    32,1199
7F  2350 DATA 32,61,66,66,79,80,
    84,65,66,65,97,97,90,100,100
    ,100,1248
49  2360 DATA 41,32,32,60,65,66,
    79,80,65,66,65,66,97,94,100,
    100,1108
52  2370 DATA 93,100,41,32,32,61
    ,66,65,79,80,84,128,127,127,
    97,95,1307
FD  2380 DATA 100,92,100,100,122
    ,32,32,60,66,65,79,80,84,65,
    65,66,1208
8C  2390 DATA 97,97,91,100,100,1
    00,41,32,32,61,66,66,79,80,8
    4,66,1192
FB  2400 DATA 66,65,97,97,97,91,
    92,100,122,32,202,60,65,65,7
    9,80,1410
C3  2410 DATA 119,66,65,66,97,97
    ,97,97,92,100,122,32,203,61,
    66,66,1446
EC  2420 DATA 79,80,84,66,66,65,
    97,97,97,90,100,92,41,32,32,
    60,1178
FC  2430 DATA 65,66,79,80,65,65,
    66,66,97,97,94,100,100,100,4
    1,32,1213
A8  2440 DATA 32,61,66,66,79,80,
    84,66,65,65,97,97,96,100,100
    ,100,1254
1E  2450 DATA 122,32,32,60,66,65
    ,79,80,65,66,66,66,97,97,96,
    100,1189
89  2460 DATA 100,100,41,32,32,6
    1,65,66,79,80,84,128,127,127
    ,97,97,1316
DD  2470 DATA 96,100,93,100,122,
    32,32,60,66,66,79,80,84,66,6
    5,66,1207
0E  2480 DATA 97,97,95,93,100,10
    0,122,32,32,61,65,66,79,80,1
    19,66,1304
2D  2490 DATA 66,65,97,97,90,100
    ,100,100,41,32,32,60,66,210,
    79,80,1315
42  2500 DATA 210,66,210,66,97,9
    4,100,100,86,88,63,63,63,103
    ,209,209,1827
6C  2510 DATA 79,80,209,209,209,
    209,97,95,92,100,85,82,63,63
    ,63,63,1798
2C  2520 DATA 63,63,103,80,63,63
    ,63,63,97,97,91,100,86,83,84
    ,64,1263
87  2530 DATA 64,64,64,64,64,80,
    64,64,64,64,97,97,97,91,85,8
    1,1204
A1  2540 DATA 65,73,74,65,73,74,
    65,80,84,73,74,65,97,97,97,9
    0,1246
32  2550 DATA 86,83,66,65,65,66,
    65,65,66,80,84,65,65,66,97,9
    7,1181
C8  2560 DATA 94,100,100,87,66,7
    3,74,66,73,74,66,80,65,73,74
    ,66,1231
1B  2570 DATA 97,97,95,100,100,8
    3,65,65,65,65,210,210,210,80
    ,210,210,1962
54  2580 DATA 210,210,97,97,97,9
    2,100,100,122,32,32,60,208,2
    08,79,80,1824
F4  2590 DATA 208,208,208,208,97
    ,97,94,100,100,100,41,32,32,
    61,65,66,1717
74  2600 DATA 79,80,65,66,65,66,
    97,97,96,100,93,100,41,32,32
    ,60,1169
BE  2610 DATA 66,65,79,80,119,66
    ,66,65,97,97,95,93,100,100,1
    22,32,1342
7C  2620 DATA 202,61,66,66,79,80
    ,84,128,127,127,97,97,90,100
    ,100,100,1604
E2  2630 DATA 41,32,203,60,65,21
    0,79,80,84,65,66,66,97,94,93
    ,100,1435
65  2640 DATA 100,41,122,32,32,6
    1,66,65,79,80,65,66,66,65,97
    ,96,1133
23  2650 DATA 100,100,100,122,12
    1,32,32,60,65,66,79,80,84,65
    ,66,66,1238
79  2660 DATA 97,95,100,92,100,1
    22,121,32,32,61,66,66,79,80,
    119,66,1328
69  2670 DATA 65,66,97,97,91,100
    ,100,122,121,32,32,60,66,65,
    79,80,1273
4F  2680 DATA 65,66,66,65,97,97,
    97,91,100,41,122,32,32,61,65
    ,66,1163
61  2690 DATA 79,80,84,65,66,66,
    97,97,97,90,92,100,41,32,32,
    60,1178
0F  2700 DATA 66,65,79,80,84,66,
    66,65,97,97,94,100,100,100,1
    22,32,1313
7B  2710 DATA 32,61,66,66,79,80,
    84,128,127,127,97,97,96,100,
    100,100,1440
1E  2720 DATA 122,32,32,60,65,66
    ,79,80,119,66,65,65,97,97,95
    ,100,1240
8E  2730 DATA 92,100,41,32,32,61
    ,66,66,79,80,84,66,65,66,97,
    97,1124
D3  2740 DATA 97,91,100,100,122,
    32,32,60,66,65,79,80,65,65,6
    6,66,1186
```

```
26   2750 DATA 97,97,97,90,100,10
     0,122,32,32,61,65,65,79,80,8
     4,65,1266
49   2760 DATA 65,65,97,97,94,100
     ,100,100,122,32,32,60,66,65,
     79,80,1254
3C   2770 DATA 84,66,65,66,97,97,
     95,92,100,100,41,32,32,61,65
     ,66,1159
B3   2780 DATA 79,80,119,66,66,65
     ,97,97,97,91,100,100,122,32,
     32,60,1303
3A   2790 DATA 66,65,79,80,65,66,
     65,66,97,97,97,90,92,100,41,
     32,1198
4C   2800 DATA 32,61,66,66,79,80,
     84,65,66,65,97,97,90,100,100
     ,100,1248
62   2810 DATA 41,32,32,60,65,66,
     79,80,65,66,65,66,97,94,100,
     100,1108
CE   2820 DATA 100,100,122,32,32,
     61,66,65,79,80,84,128,127,12
     7,97,95,1395
99   2830 DATA 100,92,100,100,122
     ,32,32,60,66,65,79,80,84,65,
     65,66,1208
50   2840 DATA 97,97,91,100,100,1
     00,41,32,32,61,66,66,79,80,8
     4,66,1192
11   2850 DATA 66,65,97,97,97,91,
     100,100,122,32,202,60,65,65,
     79,80,1418
41   2860 DATA 119,66,65,66,97,97
     ,97,97,93,100,122,32,203,61,
     66,66,1447
1B   2870 DATA 79,80,84,66,66,65,
     97,97,97,90,93,100,122,32,32
     ,60,1260
50   2880 DATA 65,66,79,80,65,65,
     66,66,97,97,94,100,100,100,4
     1,32,1213
FE   2890 DATA 32,61,66,65,79,80,
     84,66,65,65,97,97,96,100,100
     ,100,1253
70   2900 DATA 122,32,32,60,66,66
     ,79,80,65,66,66,66,97,97,95,
     100,1189
B8   2910 DATA 100,100,41,32,202,
     61,65,65,79,80,84,128,127,12
     7,97,97,1485
A3   2920 DATA 94,92,93,100,41,32
     ,203,60,66,66,79,80,84,66,65
     ,66,1287
13   2930 DATA 97,97,95,93,100,10
     0,114,32,32,61,65,66,79,80,1
     19,66,1296
B2   2940 DATA 66,65,97,97,90,100
     ,100,100,112,77,75,60,66,66,
     79,80,1330
6B   2950 DATA 84,66,65,66,97,94,
     100,100,100,100,112,78,32,61
     ,66,65,1286
CE   2960 DATA 79,80,84,65,66,65,
     97,95,92,100,100,100,114,32,
     32,60,1261
F2   2970 DATA 65,66,79,80,84,66,
     65,66,97,97,91,100,100,100,1
     12,32,1300
19   2980 DATA 32,61,66,65,79,80,
     84,66,66,65,97,97,90,92,100,
     100,1240
8B   2990 DATA 112,32,32,60,66,66
     ,79,80,65,128,127,127,97,90,
     93,100,1354
05   3000 DATA 100,100,114,32,32,
     61,65,66,79,80,119,65,66,65,
     94,100,1238
56   3010 DATA 100,100,86,88,63,6
     3,63,60,66,66,79,80,65,66,65
     ,66,1176
82   3020 DATA 95,100,100,100,85,
     82,63,119,120,62,165,165,79,
     80,84,65,1564
D2   3030 DATA 66,66,97,91,100,92
     ,86,86,88,63,63,70,100,100,1
     00,80,1348
17   3040 DATA 63,63,63,63,97,97,
     91,100,85,100,82,63,166,166,
     166,166,1631
6C   3050 DATA 166,166,63,63,63,6
     3,97,97,96,92,86,100,83,84,8
     4,84,1487
53   3060 DATA 66,84,84,84,84,84,
     84,84,97,97,95,93,85,100,81,
     65,1367
3D   3070 DATA 64,165,165,165,165
     ,65,64,65,64,64,97,97,90,100
     ,86,100,1616
21   3080 DATA 83,66,66,65,73,74,
     66,66,70,72,65,66,97,94,93,1
     00,1216
F5   3090 DATA 85,100,81,128,127,
     127,65,65,66,65,69,71,66,65,
     97,96,1373
D7   3100 DATA 100,100,86,100,83,
     65,66,66,70,72,65,66,65,66,6
     6,66,1202
DC   3110 DATA 97,95,100,92,85,10
     0,81,66,65,65,69,71,66,65,66
     ,66,1249
23   3120 DATA 65,66,97,97,91,100
     ,86,100,83,65,66,66,65,65,66
     ,66,1244
0D   3130 DATA 70,72,66,65,97,97,
     97,91,85,100,81,128,127,127,
     66,66,1435
91   3140 DATA 65,66,69,71,66,66,
     97,97,97,90,86,100,83,65,66,
     66,1250
DE   3150 DATA 70,72,66,65,84,65,
     65,65,97,97,94,100,85,100,81
     ,66,1272
95   3160 DATA 65,65,69,71,65,66,
     84,65,66,66,97,97,96,100,86,
     100,1258
72   3170 DATA 83,128,127,127,65,
     65,66,66,70,72,65,66,97,97,9
     5,100,1389
90   3180 DATA 85,100,81,66,66,66
     ,73,74,66,65,69,71,66,66,97,
     97,1208
3F   3190 DATA 97,91,86,100,83,66
     ,65,66,65,65,66,66,65,65,66,
     66,1178
EA   3200 DATA 65,65,65,65,65,65,
     65,65,65,66,65,66,65,66,66,6
     5,1044
2A   3210 DATA 32,40,66,65,66,65,
     66,66,128,127,127,66,65,66,6
     6,65,1176
98   3220 DATA 66,66,32,32,66,66,
     65,66,66,65,66,65,66,65,66,6
     5,983
81   3230 DATA 66,65,65,66,39,39,
     65,66,65,66,65,66,65,66,65,6
     6,995
11   3240 DATA 65,66,65,66,66,65,
     32,32,66,65,66,65,66,73,74,6
     5,997
93   3250 DATA 66,65,66,225,227,6
     5,66,66,32,40,65,66,65,66,66
     ,65,1311
7E   3260 DATA 65,65,66,65,65,226
     ,230,66,66,65,40,32,65,65,66
     ,66,1313
50   3270 DATA 65,66,65,66,65,66,
     66,65,65,66,65,66,32,39,66,6
     6,989
5A   3280 DATA 65,65,66,66,66,65,
     66,66,65,66,66,65,66,66,32,3
     2,983
F5   3290 DATA 66,65,66,66,65,65,
     66,66,65,66,66,65,66,66,65,6
     6,1050
DF   3300 DATA 32,40,65,66,65,66,
     66,73,74,65,66,66,65,66,66,6
     5,1006
18   3310 DATA 66,65,40,32,66,65,
     66,66,66,65,65,66,66,65,66,6
     5,990
D6   3320 DATA 65,65,66,66,39,32,
     65,66,65,65,66,66,65,66,65,6
     6,988
DF   3330 DATA 65,66,66,66,66,65,
     40,32,66,66,65,66,65,66,66,6
     5,991
16   3340 DATA 66,65,66,225,227,6
     5,65,66,32,39,65,66,66,65,66
     ,73,1317
B6   3350 DATA 74,66,65,66,65,226
     ,230,66,66,65,39,32,66,65,66
     ,66,1323
63   3360 DATA 66,65,65,65,66,66,
     65,66,66,66,65,66,32,32,66,6
     6,983
83   3370 DATA 65,66,66,66,65,66,
     66,65,66,65,65,66,66,65,39,3
     2,989
68   3380 DATA 65,66,66,66,65,65,
     66,65,66,66,65,66,66,65,66,6
     6,1050
FB   3390 DATA 32,39,165,165,165,
     165,165,165,165,165,165,165,
     165,165,165,165,2381
8C   3400 DATA 165,165,32,32,204,
     204,204,204,204,204,204,204,
     204,204,204,204,2842
A4   3410 DATA 204,204,204,207,39
     ,32,206,206,206,206,206,206,
     206,206,206,206,2950
46   3420 DATA 206,206,206,206,20
     6,205,32,39,204,204,204,204,
     204,204,204,204,2938
07   3430 DATA 204,204,204,204,20
     4,204,207,39,32,32,206,206,2
     06,206,206,206,2770
59   3440 DATA 206,206,206,216,21
     3,100,100,215,228,40,39,39,2
     04,204,204,204,2624
C3   3450 DATA 204,204,204,204,20
     4,213,100,100,100,214,32,40,
     32,32,206,206,2295
42   3460 DATA 206,206,206,206,20
     6,206,206,211,211,211,211,22
     9,40,39,32,32,2658
67   3470 DATA 204,204,204,204,20.
     4,204,204,204,204,204,204,20
     4,207,32,39,32,2758
83   3480 DATA 32,39,208,208,208,
     208,208,208,208,208,208,208,
     208,208,68,40,2675
7D   3490 DATA 32,39,32,32,66,65,
     66,65,66,65,66,66,65,66,65,6
     6,922
09   3500 DATA 68,39,40,32,32,32,
     65,66,65,66,65,66,65,66,66,6
     5,898
A1   3510 DATA 66,65,68,40,40,39,
     39,32,66,65,66,65,66,65,66,6
     5,913
E1   3520 DATA 66,66,65,66,68,40,
     39,32,32,39,66,65,66,66,65,6
     6,907
4C   3530 DATA 65,66,66,65,66,66,
     68,32,32,39,39,32,65,66,66,6
     5,898
AF   3540 DATA 66,65,66,66,65,66,
     66,65,68,39,39,32,39,39,66,6
     5,912
53   3550 DATA 65,66,65,66,128,12
     7,127,66,66,66,68,40,32,32,3
     2,32,1078
CF   3560 DATA 65,66,65,66,65,66,
     188,188,188,188,188,188,68,3
     2,39,39,1699
45   3570 DATA 39,32,66,65,66,65,
     66,65,171,192,192,192,192,19
     2,191,40,1826
A3   3580 DATA 32,40,32,32,66,65,
     66,66,65,189,193,192,192,192
     ,192,192,1806
```

```
BA  3590 DATA 191,39,32,39,32,39
    ,65,66,65,66,66,190,193,192,
    192,192,1659
AD  3600 DATA 192,192,191,32,40,
    32,39,32,66,65,66,65,66,65,1
    70,192,1505
70  3610 DATA 192,192,192,192,19
    1,39,39,39,32,39,65,66,65,66
    ,65,66,1540
54  3620 DATA 65,66,66,65,66,66,
    68,39,32,40,39,32,66,65,66,6
    6,907
7C  3630 DATA 66,65,128,127,127,
    66,66,65,68,32,39,39,32,32,6
    5,66,1083
6A  3640 DATA 65,66,65,66,65,65,
    66,65,65,66,68,40,39,40,32,3
    9,912
5E  3650 DATA 65,65,65,65,65,65,
    65,65,65,66,65,66,68,39,39,4
    0,968
D4  3660 DATA 32,40,66,65,66,65,
    66,66,128,127,127,66,65,66,6
    8,32,1145
44  3670 DATA 32,39,32,32,66,66,
    65,66,66,65,66,65,66,65,66,6
    5,922
C2  3680 DATA 68,40,40,40,39,39,
    65,66,65,66,65,66,65,66,65,6
    6,921
A6  3690 DATA 65,66,68,39,39,32,
    32,32,66,65,66,65,66,73,74,6
    5,913
1D  3700 DATA 66,65,66,66,68,39,
    39,39,32,40,65,66,65,66,66,6
    5,913
F4  3710 DATA 65,65,66,65,65,66,
    68,40,40,32,40,32,65,65,66,6
    6,906
3E  3720 DATA 65,66,65,66,65,66,
    66,65,68,32,39,40,32,39,66,6
    6,906
45  3730 DATA 65,65,66,66,66,65,
    66,66,65,66,68,39,39,39,32,3
    2,905
F1  3740 DATA 66,65,66,65,65,65,
    66,66,65,66,66,65,68,40,39,3
    9,972
99  3750 DATA 32,40,65,66,65,66,
    66,73,74,66,65,66,65,66,68,3
    2,975
69  3760 DATA 39,32,40,32,66,65,
    66,66,66,65,65,65,66,65,66,6
    5,929
FF  3770 DATA 68,40,40,32,39,32,
    65,66,65,65,66,66,65,66,65,6
    6,906
EB  3780 DATA 65,66,68,39,39,39,
    40,32,66,66,65,66,65,66,66,6
    5,913
B2  3790 DATA 66,65,66,65,68,39,
    40,32,32,39,65,66,66,65,66,6
    6,906
74  3800 DATA 65,66,65,66,65,66,
    68,40,39,32,39,32,66,65,66,6
    6,906
05  3810 DATA 66,65,66,123,125,6
    6,65,66,68,40,32,39,32,32,66
    ,66,1017
04  3820 DATA 65,66,65,66,66,124
    ,126,65,66,65,68,32,39,32,39
    ,32,1016
4B  3830 DATA 65,65,66,66,66,65,
    66,65,66,66,65,66,68,39,39,3
    2,965
3D  3840 DATA 32,39,66,65,66,188
    ,188,188,188,188,188,188,188
    ,188,68,40,2068
A6  3850 DATA 32,40,32,32,65,66,
    65,115,201,201,201,201,201,2
    01,201,201,2055
D8  3860 DATA 200,39,40,39,39,32
    ,65,66,66,115,201,201,201,20
    1,201,201,1907
50  3870 DATA 201,201,200,40,39,
    32,32,39,64,66,65,115,201,20
    1,201,201,1898
D9  3880 DATA 201,201,201,201,20
    0,39,39,39,32,32,97,65,66,11
    5,201,201,1930
03  3890 DATA 201,201,201,201,20
    1,201,200,40,40,40,39,39,66,
    66,66,115,1917
02  3900 DATA 201,201,201,201,20
    1,201,201,201,200,39,32,40,3
    2,32,65,66,2114
84  3910 DATA 65,115,201,201,201
    ,201,201,201,201,201,200,39,
    40,39,32,32,2170
70  3920 DATA 66,65,66,115,201,2
    01,201,201,201,201,201,201,2
    00,39,39,32,2230
F5  3930 DATA 32,39,66,65,66,115
    ,201,201,201,201,201,201,201
    ,201,200,40,2231
D5  3940 DATA 32,39,32,32,66,66,
    65,115,201,201,201,201,201,2
    01,201,201,2055
54  3950 DATA 200,39,40,32,32,32
    ,65,65,66,115,201,201,201,20
    1,201,201,1892
48  3960 DATA 201,201,200,40,40,
    39,39,32,66,66,65,66,66,66,6
    6,66,1319
C5  3970 DATA 66,66,66,66,68,40,
    39,32,32,39,66,65,66,66,65,6
    6,908
F8  3980 DATA 65,66,66,65,66,66,
    68,32,32,39,39,32,65,66,66,6
    5,898
A3  3990 DATA 66,65,66,66,65,65,
    66,65,68,39,39,32,39,39,66,6
    5,911
3F  4000 DATA 65,66,65,66,128,12
    7,127,66,65,66,68,40,32,32,3
    2,32,1077
24  4010 DATA 65,66,65,66,65,66,
    65,65,65,65,66,65,68,32,39,3
    9,962
3B  4020 DATA 39,32,66,65,66,65,
    66,65,66,65,66,66,65,66,68,4
    0,966
85  4030 DATA 32,40,32,32,66,65,
    66,66,65,66,65,70,72,66,65,6
    6,934
80  4040 DATA 68,39,32,39,32,39,
    65,66,65,66,66,65,66,69,71,6
    5,913
15  4050 DATA 66,65,68,32,40,32,
    39,32,66,65,66,65,66,65,66,6
    5,898
B9  4060 DATA 65,66,65,66,68,39,
    39,39,32,39,65,66,65,66,65,6
    6,911
EF  4070 DATA 65,66,66,65,66,66,
    68,39,32,40,39,32,66,65,66,6
    6,907
C4  4080 DATA 66,65,66,66,65,66,
    66,65,68,32,39,39,32,32,65,6
    6,898
AB  4090 DATA 65,66,65,66,65,65,
    66,65,65,66,68,40,39,40,32,3
    9,912
6A  4100 DATA 65,65,65,65,65,65,
    65,65,65,66,65,66,68,39,39,4
    0,968
D0  4110 DATA 32,40,66,65,66,65,
    66,66,128,127,127,66,65,66,6
    8,32,1145
48  4120 DATA 32,39,32,32,66,66,
    65,66,66,65,66,65,66,65,66,6
    5,922
26  4130 DATA 68,40,40,40,39,39,
    65,66,65,66,65,66,65,66,65,6
    6,921
7F  4140 DATA 65,66,68,39,39,32,
    32,32,66,65,66,65,66,65,66,6
    5,897
C9  4150 DATA 66,65,66,66,68,39,
    39,39,32,40,65,66,65,66,66,6
    5,913
88  4160 DATA 66,65,66,65,65,66,
    68,40,40,32,40,32,65,65,66,6
    6,907
0E  4170 DATA 65,66,65,66,65,66,
    66,66,68,32,39,40,32,39,66,6
    6,907
E7  4180 DATA 65,65,66,66,66,65,
    66,65,66,65,68,39,39,39,32,3
    2,904
9B  4190 DATA 66,65,66,66,65,65,
    66,66,65,66,65,66,68,40,39,3
    9,973
7F  4200 DATA 32,40,65,66,65,65,
    66,73,74,74,74,65,66,66,68,3
    2,991
C5  4210 DATA 39,32,40,32,66,65,
    66,66,66,65,65,65,65,65,66,6
    5,928
EB  4220 DATA 68,40,40,32,39,32,
    65,66,65,65,66,66,65,66,65,6
    6,906
7F  4230 DATA 65,66,68,39,39,39,
    40,32,66,66,65,66,65,66,66,6
    5,913
2E  4240 DATA 66,65,66,65,68,39,
    40,32,32,39,65,66,66,65,66,6
    6,906
D8  4250 DATA 65,66,65,66,65,66,
    68,40,39,32,39,32,66,65,66,6
    6,906
B4  4260 DATA 66,65,66,65,66,66,
    65,66,68,40,32,39,32,32,66,6
    6,900
33  4270 DATA 65,66,65,66,65,66,
    65,65,66,65,68,32,39,32,39,3
    2,896
CF  4280 DATA 65,65,66,66,65,65,
    66,65,66,66,65,66,68,39,39,3
    2,964
E9  4290 DATA 32,39,66,65,66,65,
    66,66,65,127,127,127,66,65,6
    8,40,1150
28  4300 DATA 32,40,32,32,65,66,
    65,66,65,66,66,65,188,188,18
    8,188,1412
B7  4310 DATA 68,39,40,39,39,32,
    65,65,66,65,66,66,65,171,193
    ,193,1272
3C  4320 DATA 193,193,196,40,39,
    32,32,39,66,66,65,123,125,65
    ,189,193,1656
7F  4330 DATA 193,193,193,193,19
    6,39,39,39,32,32,65,66,66,12
    4,126,66,1662
C1  4340 DATA 190,193,193,193,19
    3,193,196,40,40,40,39,39,66,
    65,66,66,1812
8C  4350 DATA 65,66,65,170,193,1
    93,193,193,196,39,32,40,32,3
    2,66,66,1641
51  4360 DATA 65,65,66,65,66,65,
    66,66,66,66,68,39,40,39,32,3
    2,906
A6  4370 DATA 65,65,66,66,65,66,
    65,127,127,127,65,66,68,39,3
    9,32,1148
89  4380 DATA 32,39,66,66,65,66,
    65,66,66,65,65,66,66,65,68,4
    0,966
C9  4390 DATA 32,39,32,32,66,65,
    66,65,66,65,66,66,66,65,65,6
    6,922
E3  4400 DATA 68,39,40,32,32,32,
    65,66,65,66,65,66,65,66,65,6
    6,898
29  4410 DATA 66,65,68,40,40,39,
    39,32,66,65,66,65,66,65,66,6
    5,913
B3  4420 DATA 66,66,65,65,68,40,
    39,32,32,39,66,65,66,66,65,6
    6,906
```

```
44   4430 DATA 65,66,66,65,66,66,
     68,32,32,39,39,32,65,66,66,6
     5,898
8F   4440 DATA 66,65,66,66,65,65,
     66,65,68,39,39,32,39,39,66,6
     5,911
93   4450 DATA 65,66,65,66,128,12
     7,127,66,65,66,68,40,32,32,3
     2,32,1077
D0   4460 DATA 65,66,65,66,65,66,
     65,65,65,65,66,65,68,32,39,3
     9,962
1F   4470 DATA 39,32,66,65,66,65,
     66,65,66,65,66,66,65,66,68,4
     0,966
C4   4480 DATA 32,40,32,32,66,65,
     66,66,65,66,65,66,65,66,65,6
     6,923
5A   4490 DATA 68,39,32,39,32,39,
     65,66,65,66,66,65,66,73,74,6
     5,920
C9   4500 DATA 66,65,68,32,40,32,
     39,32,66,65,66,65,66,65,66,6
     5,898
B5   4510 DATA 65,66,65,66,68,39,
     39,39,32,39,65,66,65,66,65,6
     6,911
F3   4520 DATA 65,66,66,65,66,66,
     68,39,32,40,39,32,66,65,66,6
     6,907
30   4530 DATA 66,65,66,66,65,66,
     66,65,68,32,39,39,32,32,65,6
     6,898
07   4540 DATA 65,66,65,66,65,65,
     66,65,65,66,68,40,39,40,32,3
     9,912
E5   4550 DATA 65,65,65,65,65,65,
     65,65,65,66,65,66,68,39,39,4
     0,968
CD   4560 DATA 32,40,66,65,66,65,
     66,66,128,127,127,66,65,66,6
     8,32,1145
05   4570 DATA 32,39,32,32,66,66,
     65,66,66,65,66,65,66,65,66,6
     5,922
47   4580 DATA 68,40,40,40,39,39,
     65,66,65,66,65,66,65,66,65,6
     6,921
23   4590 DATA 65,66,68,39,39,32,
     32,32,66,65,66,65,66,73,74,6
     5,913
D1   4600 DATA 73,74,66,66,68,39,
     39,39,32,40,65,66,65,66,66,6
     5,929
BE   4610 DATA 65,65,65,65,65,66,
     68,40,40,32,40,32,65,65,66,6
     6,905
86   4620 DATA 65,66,65,66,65,66,
     66,65,68,32,39,40,32,39,66,6
     6,906
BD   4630 DATA 65,65,66,66,66,65,
     66,66,65,66,68,39,39,39,32,3
     2,905
C1   4640 DATA 66,65,66,65,66,65,
     66,66,65,66,66,65,68,40,39,3
     9,973
65   4650 DATA 32,40,65,66,65,66,
     0,0,169,0,133,250,169,128,13
     3,251,1567
89   4660 DATA 169,0,133,174,133,
     193,169,64,133,175,133,194,1
     69,200,133,252,2424
21   4670 DATA 169,156,133,253,16
     0,0,177,250,145,174,230,250,
     208,2,230,251,2788
E7   4680 DATA 230,174,208,2,230,
     175,165,250,197,252,208,234,
     165,251,197,253,3191
46   4690 DATA 208,228,169,99,133
     ,187,169,157,133,188,169,3,1
     33,183,169,0,2328
B8   4700 DATA 133,185,160,0,185,
     51,157,240,6,32,210,255,200,
     208,245,32,2299
C7   4710 DATA 207,255,240,251,20
     1,49,240,4,201,56,48,230,41,
     15,133,186,2357
D3   4720 DATA 76,234,245,147,17,
     17,73,78,80,85,84,32,68,69,8
     6,73,1464
EB   4730 DATA 67,69,32,78,85,77,
     66,69,82,13,17,67,65,83,61,4
     9,980
57   4740 DATA 32,47,32,68,73,83,
     75,61,32,56,32,79,82,32,57,5
     8,899
82   4750 DATA 45,32,0,87,84,51,0
     ,0,0,0,0,0,0,0,0,0,299
7A   4760 DATA 0,0,0,255,255,255,
     255,0,0,0,0,0,0,0,0,0,1020
```

## SOFTWARE

**YOUR COMMODORE SPECIALS**

**TECH DRAW 64** - A comprehensive technical illustration aid for C64 owners for both disk and tape. Commands available include LINE DRAW, RAYS, BOX, CIRCLE, ARC, ELLIPSE, FREEHAND, FILL, HATCH & TEXT. Wipe copy, move and rotate, save and load or print your drawing all for £8.95 tape or disk. Order Codes TD64T (tape) TD64D (disk)

*Full details in Your Commodore July 1987.*

**SPEEDY ASSEMBLER**

Your Commodore's very own Assembler, a 100% memory resident program for loading from tape or disk, featured in the Your Commodore Machine Code Series and now the Y.C. standard assembler only £9.95 Tape or Disk. Order Codes YSPASSD (disk) YSPASSR (tape)

Order from Your Commodore Readers Services at 9, Hall Road, Maylands Wood Estate, Hemel, Hempstead Herts HP2 7BH. Please make cheques payable to A.S.P. Ltd., or telephone your Access/Visa order on 0442 41221

COMMODORE 64/128 CASSETTE ONLY

**X RATED ADULTS ONLY GAME**

**FANTASY**

**ONLY £6.50**



**Loosen your collar, get out your JOYSTICK and get stuck in. By the time you finish you'll be exhausted.**

**WARNING if you are easily offended do NOT order this game.**

**R'n'H MICROTEC**
**32 Hazell Way**
**Stoke Pages**
**BUCKS SL2 44D**

**ONLY AVAILABLE BY MAIL ORDER**

**DISCOUNT SOFTWARE**

Up to 21% off RRP for ATARI, COMMODORE, SPECTRUM, AMSTRAD, BBC, MSX and IBM PC. Ring for Info Pack on any of the above machines: 24 hour HOTLINE: 0455 613377.

**B. BYTES COMPUTER SYSTEMS,**
**19 Southfield Road, Hinkley,**
**Leicestershire LE10 1UA.**
**ATARI SPECIALISTS**

**BAKEEX**

**AN ESSENTIAL UTILITY PROGRAM FOR YOUR COMMODORE 64**

Basic keyword extension will add 36 new functions to your computer. Does not take up any programable memory used by Basic. (On tape only) Price **£8.00**. Fully documented. Please send cheques/postal orders to:

**COMMODORE 64**
**40 Marlinespike,**
**Shoreham Beach,**
**West Sussex BN4 5RD.**

## SPECIAL OFFERS

**T.C. COMPUTERS**

**TEL: Wantage 02357 60177**

| | |
|---|---|
| AMIGA A500★★ | £369.99 |
| AMIGA A500 + CM 8833★★ | £595.00 |
| AMIGA A500 + 1084 + 1Mb 2nd Drive ★★ | £649.00 |
| AMIGA A500 + Multi-Sync Colour Monitor ★★ | £760.00 |
| AMIGA System 500 ★ | £759.00 |
| COMMODORE PC1 - mono | £345.00 |

*Also Atari ST & PC Compatibles*
*Full Commodore range of PC's*

**ENQUIRIES WELCOME**
**SAE for details to:**
**19 Havenvale, Wantage,**
**Oxfordshire OX12 7AJ**

★ Colour ★★ Inc Free Software

**THIS SPACE COULD BE YOURS**

## ADVERTISERS

**FOR MORE DETAILS OF ADVERTISING IN YOUR COMMODORE TELEPHONE ALAN COLE ON 01 437 0626**

## SERVICES

**COMMODORE SUPPLIES**

| | |
|---|---|
| C64 Power Pack | 19.95 |
| 64 Data Rec (Binatone) | 17.95 |
| C3N (C.16) Data Rec | 17.95 |
| 64 Music Expansion Syst | 69.95 |
| Neous Mouse and Cheese | 19.95 |

*Prices include VAT & P&P. Chq to:*

**OMNIDALE LTD**
**23 Curzon Street, Derby.**
**Tel: 0332 291219**

## DEALERS

**MIGHTY MICRO**

**Sherwood Centre,**
**268 Wilmslow Road,**
**Fallowfield,**
**M14 6WL**
**Contact Steven**
**Tel: (061) 224 8117**
**COMMODORES PREFERRED EDUCATIONAL DEALER**
**PERSONAL EXPORT SPECIALIST**

## DISKS

Why Take Risks?...Buy **Branded** disks.

**GOLDSTAR 3½" DS/DD DISKS**
Boxed in 10's, 100% error free, Branded, Fully Guaranteed, Includes Labels.

**£8.30 + VAT Per box of 10**

PLEASE ADD 87p + VAT FOR P&P
Goods sent same day as order received.

**P.V. TUBES (MAIL ORDER DEPT.)**
104 Abbey St., Accrington, Lancs, BB5 1EE
Tel: (0254) 36521/32611/390936
Fax: 0254-395361
PARTNERS: Mrs. S. Cucknell/Mr. B. Cucknell

## LANGUAGES

**PLUS4 FORTH DISK. £9.99**

MetacomPiler FIG/79. 32Kbytes.
Auto Tape/disk and Start.
HIRES: DRAW & DUMP. DEFINABLE CHARS: Complete with 50 + commented screens.

**TENSAL TECHNOLOGY**
**15, Penrice Close, W-S-M, Avon BS22 9AH.**
**Tel: (0934) 27539**

## RIBBONS

| | | | |
|---|---|---|---|
| Cannon PW 1080A | £2.69 | Commodore MPS803 | £2.75 |
| Citizen 120D | £3.50 | Epson MX/RX/FX80 | £2.75 |
| Citizen MSP10 | £2.75 | Epson LX80/86 | £2.40 |
| Commodore 4022 | £2.75 | Kaga Taxan | £2.69 |
| Commodore 4023 | £2.90 | Seikosha GP100 | £2.10 |
| Commodore MPS801 | £2.60 | Star NL10 | £4.10 |

*Please add 15% VAT, carriage free.*

**T-Systems Ltd**
**The Signal Cabin, 61 High Street, Orpington, Kent BR6 0JF**
**Access card accepted. Tel: 0689 22196**

## HARDWARE

**BOWIE ELECTRONICS**
**THE COMPUTER CLINIC**

Large stocks of Hardware and Software for all Commodore Micro's.

You'll be amazed at our discounts for hardware and Software.

*Up to 30% off Computer Games.*

*Up to 25% off Hardware.*

Commodore Amiga & 3 Games & 10 Disks + FREE Mouse Mat .......... **£360.00**

In house computer repair centre FREE Game with every repair undertaken.

**PHONE: 0224 895159**
**15 MENZIES ROAD, ABERDEEN.**

# REPAIRS GUIDE

**CALL ALAN COLE ON 01 437 0626**

**SPARES REPAIRS SALES**

all makes of computers & peripherals
Fast Reliable Guaranteed Service

**Contact Dave Barber H.Eng., AMIERE**

**db ELECTRONIC SERVICES**

**205 Meadgate Avenue, Gt. Baddow, Chelmsford, Essex. CM2 7NJ**
**Tel: 0245 - 260874**

**M.C.E. SERVICES**

**33, Albert Street, Mansfield, Notts NG18 1EA Tel: 0623 653512**

*FIXED PRICE COMMODORE REPAIRS*

| | |
|---|---|
| C64 | £24.95 |
| C16 | £19.95 |
| PLUS4 | £24.95 |
| AMIGA A.500 | £29.95 |
| 1541 | £29.95 |
| 1571 | £31.95 |
| C2N etc | £12.95 |

***All prices inc. VAT, Labour, Parts etc. NO MORE TO PAY. Please ring for details.***

**COPY DEADLINE FOR FEBRUARY ISSUE IS 22nd NOVEMBER**

# B A E A K

## Bug Finder

We'd like to remind our readers that we run a Bug Finder service.

If you have typed in one of our programs and despite much checking, you still can't get it to run, then send us the following:

Two copies of your program on tape or disk.
A description of your problem.
If possible a listing of your work (you may omit this).
A stamped, self-addressed envelope for return of the program to you.

Should any of the above be missing then we will not be able to deal with your query.

We will try to point out where you have made errors and place a corrected copy of the program back on to your tape or disk before we return it to you.

Do not send a program to us as soon as it stops working, please check it several times first.

We do get a large number of queries and so it may take a while for us to deal with yours personally.

**Note:** we can only deal with problems relating to programs published in *Your Commodore*.

## Readers Problems

Though the Commodore 64 is one of the world's most popular microcomputers, it can be very difficult to find speecific information about your particular machine.

At the *Your Commodore* office we receive literally hundreds of letters from you, our readers, on a wide range of subjects ranging from the simple 'Can you give me the telephone number for ...', to the more complex 'I'm trying to write a program that uses a split screen. How do I do it?'

Unfortunately, the volume of mail received has become so great that it is impossible to answer every letter and still mange to publish a magazine each month.

For this reason we have felt it necessary to produce a number of guidelines for getting information from us.

1) We cannot guarantee to answer every letter sent to the magazine. Should it become apparent that a number of readers are suffering from the same problem, then we will reply to the letter via the Letters page.

2) A new helpline has been set up. This will be open for your queries on Tuesday and Thursday afternoons between 2.00pm and 4.00pm. We will not be able to deal with your telephone queries at any other time. If our technical adviser is not available when you ring, then a message will be taken

3) If you are having problems with one of our listings, can you please let us know in writing. This will enable us to see if a number of people are having the same problem. When a common problem becomes apparent with a program, then a correction sheet will be issued. Enclose a self-addressed, stamped envelope and we will send you a copy of the correction sheet as soon as it is available.

We are sorry that it has become necessary to instigate these rules. However, we are sure that you will agree with us that the more time that we can spend making *Your Commodore* the most informative magazine around, the better.

For program queries write to:
Program Corrections
Your Commodore
1 Golden Square
London
W1R 3AB
If you wish to telephone then call:
01-437 0626 Extn 212

# "THE MAIN EVENT"

## DEPT (YC) 61 STAFFORD STREET, HANLEY, STOKE-ON-TRENT, STAFFORDSHIRE ST1 1LW

## 24 HOUR ANSWER SERVICE. TEL: 0782 281544

### COMMODORE 64

| | |
|---|---|
| OLLIES FOLIES | 1.75 |
| WEB | £1.75 |
| REAL YOU | £1.75 |
| SLURPY | £1.75 |
| AMAVROTE | £1.75 |
| ARCADIA | 1.75 |
| **GALATIC GARDENER** | 1.75 |
| WORLD CUP FOOTBALL | 1.75 |
| PYRAMID | 1.75 |
| BEAKY & EGG SNATCHER | 1.75 |
| GOLF | 1.75 |
| TITANIC | 1.75 |
| RATSPORT | 1.75 |
| HELION | 1.75 |
| AM CONDOR | 1.75 |
| EGBERT | 1.75 |
| FABULOUS WANDA | 1.75 |
| WILD WEST | 1.75 |
| EUREKA | 1.75 |
| SPYS DEMISE | 1.75 |
| STREET MACHINE | 1.75 |
| ZIP | 1.75 |
| DESTRUCT | 1.75 |
| OSMIUM | 1.75 |
| AQUANAUT | 1.75 |
| DANTES INFERNO | 1.75 |
| HARTLAND | 1.75 |
| PAZZAR | 1.75 |
| PCW GAMES COLL | 1.75 |
| BIOLOGY | 1.75 |
| GEOGRAPHY | 1.75 |
| HISTORY | 1.75 |
| GERMAN | 1.75 |
| GORTEX | 1.75 |
| QUAKE | 1.75 |
| PSI WARRIOR | 1.75 |
| ANRIGA | 1.75 |
| VELOCIPEDE | 1.75 |
| FUNGUS | 1.75 |
| DESERT HAWK | 1.75 |
| RONALD ROBBERDUCK | 1.75 |
| ELECTRIX | 1.75 |
| F.A. CUP | 1.75 |
| TOMAHAWK | 1.75 |
| BATALYX | 1.75 |
| SCROLLS OF ABADON | 1.75 |
| CRAZY COASTER | 1.75 |
| TOAD FORCE | 1.75 |
| CLEAN UP TIME | 1.75 |
| F.A. CUP 87 | 1.75 |
| FORCASTER | 1.75 |
| PROJECT PLANNER | 1.75 |
| NUMBERS AT WORK | 1.75 |
| DECISION MAKER | 1.75 |
| ENTREPRENEUR | 1.75 |
| FLYING FEATHERS | 1.75 |
| KICK OFF | 1.75 |
| CO LEVEL | 1.75 |
| CODE NAME MARK 2 | 1.75 |
| CHINESE JUGGLER | 1.75 |
| ENCOUNTER | 1.75 |
| NIGHT SHADE | 1.75 |
| BROAD STREET | 1.75 |
| PYRAMID/TITANIC | 1.75 |
| BEAKY/RATSPORT | 1.75 |
| SOFTWARE STAR | 1.75 |
| ROCK N BOLT | 1.75 |
| MORDENS QUEST | 1.75 |
| FORBIDDEN FOREST | 1.75 |
| PANIC | 1.75 |
| ZIM SALA BIM | 1.75 |
| HAMPSTEAD | 1.75 |
| SENTINEL | 1.75 |
| ADRIAN MOLE | 1.75 |
| ENIGMA FORCE | 1.75 |
| STARION | 1.75 |
| ASSAULT MACHINE | 1.75 |
| WARRIOR II | 1.75 |
| STOCK CAR | 1.75 |
| CYBERTRON MISSION | 1.75 |
| BUMBLEBEE | 1.75 |
| FELIX IN FACTORY | 1.75 |
| FRENZY | 1.75 |
| GHOULS | 1.75 |
| SWOOP | 1.75 |
| ELECTION | 1.75 |
| SHERLOCK HOLMES | 1.75 |
| PARADROID | 1.75 |
| HIDE AND SEEK | 1.75 |
| MOON SUTTLE | 1.75 |

### COMMODORE 64

| | |
|---|---|
| SUPERCAN | 2.50 |
| B 24 | 2.50 |
| TOOTH INVADERS | 2.50 |
| MISSION 2 | 2.50 |
| HENRYS HOUSE V 1 | 2.50 |
| HENRYS HOUSE V 2 | 2.50 |
| TURBO 64 | 2.50 |
| PILOT 64 | 2.50 |
| SUPERMAN | 2.50 |
| DANGERMOUSE | 2.50 |
| JET SET WILLIE | 2.50 |
| NEXUS | 2.50 |
| EVIL CROWN | 2.50 |
| CHUCKIE EGG | 2.50 |
| MANIC MINDER | 2.50 |
| BOUNTY BAR | 2.50 |
| ON COURT BASEBALL | 2.50 |
| BLACK WYCHE | 2.50 |
| SKY RUNNER | 2.50 |
| BOULDERDASH | 2.50 |
| BOULDERDASH 2 | 2.50 |
| AVENGER | 2.50 |
| FUTURE KNIGHT | 2.50 |
| RANA RAMA | 2.50 |
| HYPABALL | 2.50 |
| DANDY | 2.50 |
| ELEVATOR ACTION | 2.50 |
| NUCLEAR EMBARGO | 2.50 |
| MISSION AD | 2.50 |
| INT KARATE | 2.50 |
| TRAP | 2.50 |
| PRODIGY | 2.50 |
| EXPLORA | 2.50 |
| PUB GAMES | 2.50 |
| GREYFELL | 2.50 |
| DEACTIVATORS | 2.50 |
| GOBOTS | 2.50 |
| HYBRID | 2.50 |
| MOUNTIE MICK | 2.50 |
| TRIAXAS | 2.50 |
| PILE UP | 2.50 |
| WERNER | 2.50 |
| CHAMELEON | 2.50 |
| EIDOLON | 2.50 |
| CAPTURED | 2.50 |
| GOLDEN OLDIES | 2.50 |
| ALIENS | 2.50 |
| HOWARD THE DUCK | 2.50 |
| TRAIL BLAZER | 2.50 |
| FIFTH SQUADRON | 2.50 |
| SNAP DRAGON | 2.50 |
| HUNCH BACK | 2.50 |
| KRAKOUT | 2.50 |
| SCUBA DIVE | 2.50 |
| WORLD SERIES BASEBALL | 2.50 |
| KONG STRIKES BACK | 2.50 |
| SYSTEM 1500 | 2.50 |
| RAID | 2.50 |
| THE FORCE | 2.50 |
| MANDRA GORE | 2.50 |
| MIND SHADOW | 2.50 |
| LITTLE COMPUTER PEOPLE | 2.50 |
| IMHOTEP | 2.50 |
| MURDER ZINDER | 2.50 |
| YOUNG ONES | 2.50 |
| TOUCHDOWN FOOTBALL | 2.50 |
| STARSHIP | 2.50 |
| GYROSCOPE | 2.50 |
| LEVIATHAN | 2.50 |
| BALLBLAZER | 2.50 |
| DEUX EX MACHINA | 2.50 |
| MERMAID MADNESS | 2.50 |
| FRACTALUS | 2.50 |
| MAGIK | 2.50 |
| ADDICTABALL | 2.50 |
| LIGHTFORCE | 2.50 |
| MEGA COMPILATION | 2.50 |
| RADAR RAT RACE | 2.50 |
| SPINDIZZY | 2.50 |
| TWO ON TWO | 2.50 |
| BASEBALL | 2.50 |
| STAR RAIDER 2 | 2.50 |
| FIRE TRACK | 2.50 |
| ACTION PACK II | 2.50 |
| ULTIMATA | 2.50 |
| MAGIK MADNESS | 2.50 |
| JAIL BREAK | 2.50 |
| BOTHAMS T. MATCH | 2.50 |
| RFV WIED MONTY | 2.50 |
| CONVOY RAIDER | 2.50 |

### COMMODORE 64

| | |
|---|---|
| WINTER GAMES | 6.99 |
| FOOTBALL MANAGER 2 | 5.45 |
| R-TYPE | 6.90 |
| NINJA 2 | 8.99 |
| BUBBLE BOBBLE | 6.95 |
| SALAMANDER | 6.25 |
| WE ARE CHAMPIONS | 6.99 |
| D.T. PLYMPIC CHALLENGE | 6.99 |
| SUMMER OLYMPIAD | 6.99 |
| PSYCHO PIG OXB | 6.99 |
| REX | 6.29 |
| FERNANDUZ MUST DIE | 6.99 |
| G.L. HOTSHOT | 6.99 |
| G.L. SUPERSKILLS | 6.99 |
| SUPER HANG-ON | 6.99 |
| ULTIMATE GOLF | 6.99 |
| ROY OF THE ROVERS | 6.99 |
| SUPERSPORTS | 6.99 |
| MAD MIX GAME | 5.59 |
| LANCELOT | 10.50 |
| GREAT GIANA SISTERS | 6.99 |
| SUMMER OLYMPIAD | 6.99 |
| OVERLANDER | 6.99 |
| CALIFORNIA GAMES | 6.99 |
| CHAMPION SPRINT | 6.99 |
| DRAGON NINJA | 6.29 |
| UNTOUCHABLES | 6.29 |
| OPERATION WOLF | 6.29 |
| CYBERNOID II | 6.99 |
| INTENSITY**6.95** | |
| ECHELON | 8.99 |
| TYPHOON | 6.29 |
| GAME OVER 2 | 6.29 |
| BUBBLE GHOST | 6.99 |
| BUTCHER HILL | 6.99 |
| ARTURA | 6.99 |
| TECHNO COP | 6.99 |
| MOTOR MASSACRE | 6.99 |
| GAPLUS | 6.29 |
| VINDICATOR | 6.29 |
| ARMALYTE | 6.99 |
| TARGET RENEGADE | 6.29 |
| L.A. CRACKDOWN DISK | 10.50 |
| THE BOBBY YAZZ SHOW | 6.29 |
| CHUBBY GRISTLE | 6.95 |
| WONDERBOY | 6.95 |
| POWER PYRAMIDS | 6.95 |
| VINDICATOR | 6.29 |
| VICTORY ROAD | 6.29 |
| STRIP POKER II | 5.59 |
| MANIAX | 5.59 |
| HAWK EYE | 6.99 |
| PINK PANTHER | 6.99 |
| SKATE CRAZY | 6.99 |
| BLOOD BROTHERS | 6.99 |
| G.I. HERO | 6.95 |
| BIONIC COMMANDO | 6.99 |
| ROAD BLASTER | 6.99 |
| DREAM WARRIOR | 6.99 |
| MICKEY MOUSE | 6.99 |
| ALIEN SYNDROME | 6.99 |
| DESOLATOR | 6.99 |
| PLATOON | 6.99 |
| E EDWARDS SUPERSKI | 6.99 |
| STREET FIGHTER | 6.99 |
| SPECIAL FX | 6.29 |
| BARBARIAN II | 6.99 |
| ARKANOID II | 6.99 |
| GAUNTLET II | 6.99 |
| 720 | 6.99 |
| CHERNOBEL SYNDROME | 6.99 |
| OUTRUN | 6.99 |
| HUNTED MOON | 6.95 |
| FIREFLY | 6.29 |
| BEYOND ICE PALACE | 6.99 |
| GRYSOR | 6.29 |
| MARAUDER | 6.99 |
| EVERY SECOND COUNTS | 5.59 |
| WIZARD WARS | 6.99 |
| COMBAT SCHOOL | 6.29 |
| IKARI WARRIORS | 6.95 |
| DRAGON'S LAIR | 6.95 |
| CHARLIE CHAPLIN | 6.99 |
| ALT WORLD GAMES | 6.99 |
| SHACKLED | 6.99 |
| TYPHOON | 6.99 |
| BARDS TALE | 6.99 |
| ACTION FORCE II | 6.99 |
| T-WRECKS | 6.99 |
| GUTZ | 6.29 |

### COMMODORE 64 DISK

| | |
|---|---|
| ALTER EGO FEMALE | 7.95 |
| ALTERNATE REALITY | 6.90 |
| BAKER STREET | 4.95 |
| GUNSLINGER | 4.50 |
| CROSS CHEQUE | 4.50 |
| OCTAPUS | 4.50 |
| G.F.L. FOOTBALL | 5.95 |
| CAPTAIN AMERICA | 4.50 |
| KNIGHT GAMES 2 | 4.50 |
| EXPRESS RAIDER | 3.95 |
| DEATHSCAPE | 4.95 |
| FUTURE FINANCE | 4.95 |
| PROJECT PLANNER | 1.95 |
| FORECASTER | 1.95 |
| NUMBERS AT WORK | 2.95 |
| REAL YOU | 1.95 |
| DECISION MAKER | 2.95 |
| FANTASY FIVE | 2.95 |
| DANDY | 3.95 |
| SUSPENDED | 2.95 |
| WILD WEST | 3.95 |
| BUG BUTZ | 3.95 |
| MURDER ZINDERNOF | 3.95 |
| TOUCHDOWN FOOTBALL | 3.95 |
| BASKETBALL | 3.95 |
| GOBOTS | 4.95 |
| HYBRID | 4.95 |
| PILE UP | 4.95 |
| BLACK MAGIK | 4.95 |
| WINTER GAMES | 4.95 |
| ELITE COLLECTION | 5.90 |
| INT KARATE | 4.95 |
| HEAD COACH | 4.95 |
| PRESIDENT | 4.95 |
| GOLDEN OLDIES | 4.95 |
| PUB GAMES | 4.95 |
| FOOTBALL MANAGER | 4.15 |
| ARAC | 3.95 |
| MANDROID | 4.50 |
| PLASMANTRON | |
| OINK | 4.50 |
| TRAXXON | 4.50 |
| THUNDERCROSS | 4.50 |
| JACK THE NIPPER | 4.50 |
| DEATHSCAPE | 4.95 |
| FRANKENSTEIN | 4.50 |
| TIME FIGHTER | 4.50 |
| NINJA MASTER | 4.50 |
| DISCOVERY | 4.50 |
| JET BOYS | 4.50 |
| WOLFMAN | 4.50 |
| LIFE FORCE | 4.50 |
| I ALIEN | 4.50 |
| CUT & PASTE | 8.95 |
| CHALLENGE/GOBOTS | 4.95 |
| ENDURO RACER | 10.50 |
| 500cc GRAND PRIX | 10.50 |
| LUCAS FILM COMP | 10.50 |
| PREDATOR | 10.50 |
| SPORTS COMPILATION | 21.00 |
| INDOOR SPORTS | 10.50 |
| WONDERBOY | 10.50 |
| THEY STOLE A KILLION | 10.50 |
| 5 STAR GAMES 2 | 10.50 |
| 5 STAR GAMES 7 | 10.50 |
| LIVING DAYLIGHTS | 10.50 |
| SKATE CRAZY | 10.50 |
| SHACKLED | 10.50 |
| MIND FIGHTER | 13.99 |
| MARAUDER | 10.50 |
| HOPPIN MAD | 8.99 |
| DREAM WARRIOR | 10.50 |
| DARKSIDE | 8.99 |
| DARK CASTLE | 8.99 |
| BLOOD BROS | 10.50 |
| BLACK JACK ACADAMY | 17.50 |
| BIONIC COMMANDOS | 8.99 |
| NEWSROOM | 29.99 |
| GAMES MAKER | 13.99 |
| PRINT MASTER | 21.00 |
| TASWORD | 13.99 |
| PRINTSHOP | 29.99 |
| TOY SHOP | 39.99 |
| VIDOE TITLE SHOP | 10.50 |
| MUSIC STUDIO | 14.99 |
| STREET FIGHTER | 10.50 |
| ROAD BLASTER | 10.50 |
| STANDING STONES | 10.50 |
| MERCENARY | 6.95 |
| I.D | 8.99 |
| ELITE | 13.50 |

Please cross PO/Cheques and make payable to: THE MAIN EVENT.
To help maintain our low prices we would be obliged if you could include a first class stamp with your order, although this is NOT compulsory. Free Post & Packaging. Overseas please add 75p per tape.
We apologise for any alteration or omissions since going to press. The Main Event is a division of Software City.

# You won't find these programs in the top ten!




These programs have sold thousands of copies, and yet you won't have seen them in the charts — why?

We produce programs that you can really get your teeth into. Programs like **BUSICALC** and **BUSICALC 3** which can be used at home or in the office to do all sorts of calculations, forecasts and budgets.

Programs like **MIKRO ASSEMBLER** and the **ZOOM** monitor which make it easy to write machine code programs. Programs like **MUSIC MASTER** which turn your computer into a musical instrument. And programs like the **BLITZ** compiler which makes ordinary BASIC programs run much, much faster.

We have been writing programs for Commodore computers since 1978 and now have hundreds of programs for the PET, VIC 20, CBM 64, CBM 128, even the C16 and Plus/4. So why aren't our programs in the charts?

Because our programs aren't one minute wonders, here today and gone tomorrow. Programs we released for the 64 in 1983 are still selling — and even more important, the people who bought them then are still using them.

Software should be an investment, not money down the drain. We believe that the more you put into a program, the more you should get out of it, and that's the way it works with software from **SUPERSOFT.**

The programs listed on the right represent a small selection from our range, but you can get a full list if you phone or write to the address below. We offer an excellent mail order service, and you can pay by cheque, Access, or Visa.

**SUPERSOFT, Winchester House,**
**Canning Road, Wealdstone, Harrow,**
**Middlesex HA3 7SJ**
**Telephone: 01-861 1166**

SUPERSOFT

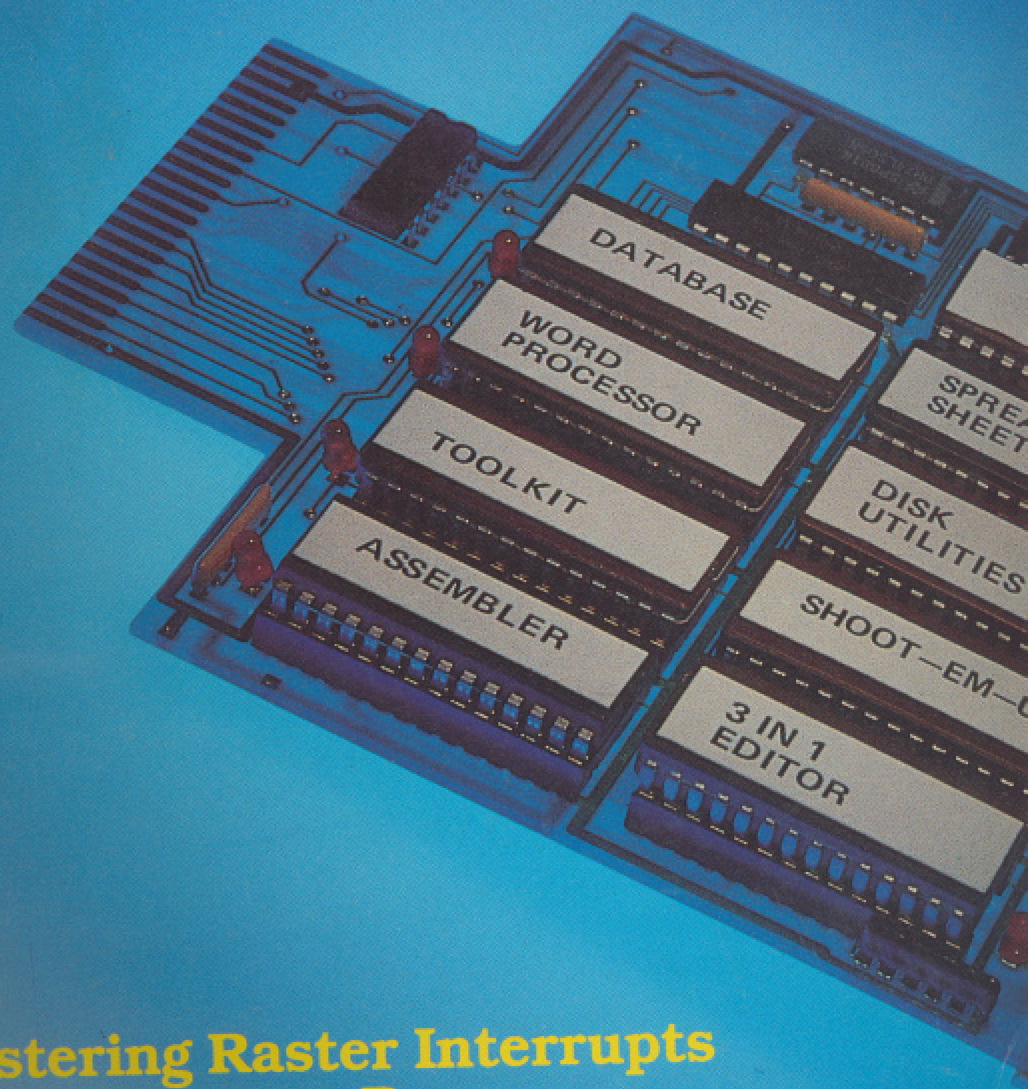
| | |
|---|---|
| For Commodore 64 | |
| Busicalc | 17.95t 19.95d |
| Mikro Assembler | 57.70c |
| Turbo Disk | 14.95d |
| Pass Your Driving Test | 8.95t |
| Music Master | 17.95t 19.95d |
| Interdictor Pilot | 17.95t 19.95d |
| Blitz Compiler | 14.95t 19.95d |
| Word Perfect | 17.95t 19.95d |
| Instant Recall | 17.95t 19.95d |
| For Commodore 128 | |
| Blitz Compiler | 29.95d |
| 128 Plus upgrade rom | 19.95r |
| Help 64/128 cartridge | 39.95c |
| For C16 and Plus/4 | |
| Turbo 16 | 6.95t |
| Graphics Designer | 6.95t 8.95d |
| Mikro Assembler | 12.95t 14.95d |
| Music Master | 12.95t 14.95d |
| Word Perfect | 12.95t 14.95d |
| For Commodore Pet | |
| Word Perfect | 51.75r |
| Flex-File 2.1 | 97.75d |
| Busicalc | 44.85t 47.15d |
| Busicalc 3 | 97.95d |
| For Commodore Amiga | |
| MIDI for Amiga | 49.75 |

Your Commodore December 1988
Volume 5 Number 3

# YOUR COMMOD

DECEMBER 1988

## A Bit on the Side
## Datel's ROM Expander




**Mastering Raster Interrupts**
**Protecting Your Programs**

UNBEATABLE PROGRAMS:
Sprite Controller △ Function Key Labeller
Directory Editor △ Double Height Characters

